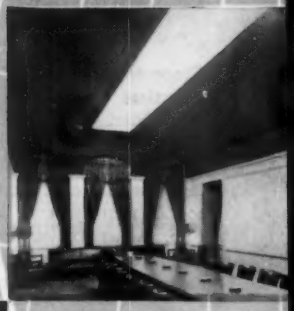
FEBRUARY • 1955
PRICE 35 CENTS

ELECTRICAL CONSTRUCTION AND MAINTENANCE

WITH ELECTRICAL CONTRACTING



FIRST PRIZE WINNING ENTRIES

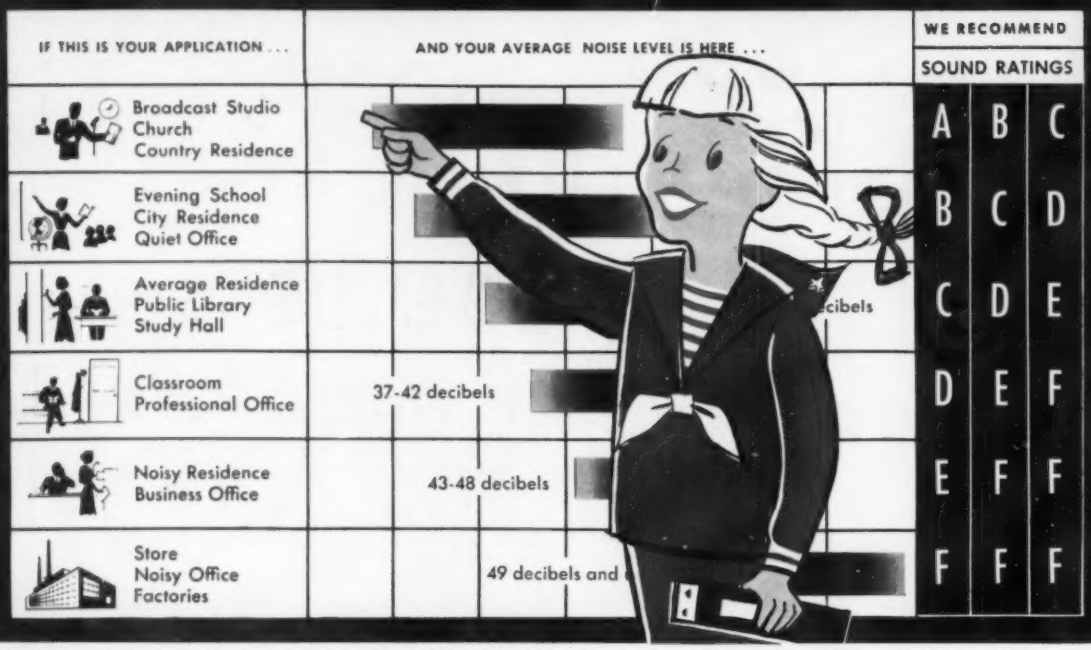
LIGHTING COMPETITION For Electrical Contractors

- Residential
- Industrial
- Store
- Office
- Floodlighting
- Miscellaneous

begins on page 67

A McGRAW-HILL PUBLICATION

54TH YEAR



FLORA SHOWS YOU how easy it is to select a G-E ballast to meet your noise level requirements. For example: in a library installation where noise levels must be extremely low, or in a quiet office where ballast noise could interfere with work, G.E. has a ballast to do the job.

Flora shows you why...*

General Electric Sound-rated Ballasts Help You Save Lighting Dollars

Fluorescent lighting today is used in a countless variety of applications; from ultra-quiet broadcast studios and library reading rooms to noisy factories and offices. To help you select a lamp-ballast combination to meet the sound requirements of your installation, General Electric conducts extensive tests to measure the average sound level of each ballast model. This measurement is called "Sound Rating."

This exclusive G-E feature enables you to specify a model sound-rated to meet the needs of your fluorescent installation. You save valuable lighting dollars by reducing expensive noise complaints.

Next time you specify equipment for a fluorescent lighting installation, make sure you get the best . . . specify General Electric sound-rated ballasts. Look for the sound rating on the nameplate. A G-E ballast tag or sticker on your fixture is proof that it's equipped with the best in ballasts. It's the easy way to be certain. For further information on G-E ballasts, write Section 401-8, General Electric Company, Schenectady 5, New York.

*Miss Fluorescent Ballast, G.E.'s Ballast Mascot.

Copyright 1955, General Electric Company.

G-E BALLASTS operate more quietly than average ballasts, and G-E engineers are constantly testing new materials and methods in order to better control ballast noise.

Five more reasons why

GENERAL ELECTRIC IS YOUR BEST BALLAST VALUE

- **SUPERIOR QUALITY CONTROL**
- **LONGER BALLAST LIFE**
- **PRECISE LAMP-MATCHED DESIGN**
- **PROVED PRODUCT LEADERSHIP**
- **COMPLETE CUSTOMER SERVICES**

Progress Is Our Most Important Product

GENERAL ELECTRIC

Light a match, start a sale!

OFFER FREEDOM FROM FEAR OF FIRE

for only $19.95

F-200 Complete surface signal unit and 2 detectors, $19.95. Flush model for new home builders, F-100. $19.95. **Your** profit—$7.98. (Additional detectors, $3.50)

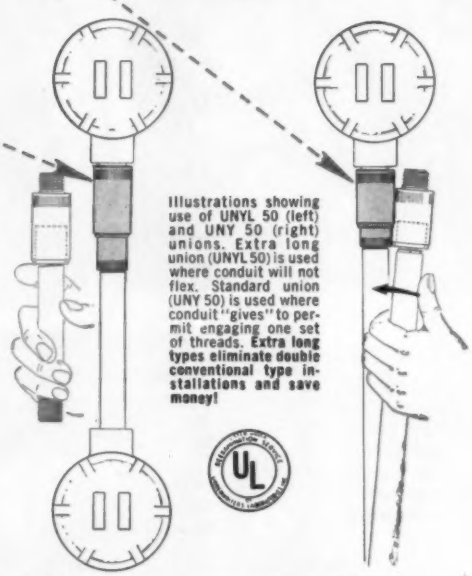
Operating Displays D-60 Flush Model above, or D-61 Surface Model, $22.95

It's a low priced, high ($7.98) profit, high volume item! It offers something everyone needs and wants—freedom from fear of fire. It's the Edwards Home Fire Alarm. Easy to demonstrate . . . easy to sell! Just hold a match under detector on Edward's dramatic demo-display—or let your prospects do it! They'll hear the loud clear life-saver bell! Explain that detectors give 400 sq. ft. safe coverage each, set off alarm at 140°. Explain that system is foolproof, automatic, electric, permanent. Never needs servicing or adjustment. Uses current only when sounding alarm. Uses low cost easily installed bell wire. Tell them that in most fires it's the first five minutes that count—**that the Edwards home fire warning system can save their homes, their family's lives!** Here's a sure-fire seller. Order from your wholesaler or write for details, Department ECM-2, Edwards Company, Norwalk, Conn. In Canada, Owens Sound.

EDWARDS HOME FIRE ALARM

NEW! Self-Adjusting Explosion-Proof EXPANSION UNIONS by APPLETON

Explosion-Proof . . . Fully Extended or Intermediate Positions



Illustrations showing use of UNYL 50 (left) and UNY 50 (right) unions. Extra long union (UNYL 50) is used where conduit will not flex. Standard union (UNY 50) is used where conduit "gives" to permit engaging one set of threads. **Extra long types eliminate double conventional type installations and save money!**

EXTRA LONG
UNYL Union showing up to 1-11/32" expansion . . . serves the purpose of two conventional type unions!

STANDARD
UNY Union showing up to 21/32" expansion . . . for installation wherever conventional types were previously used!

Only ONE Unit . . . Two Moving Parts

APPLETON Explosion-Proof Expansion Unions are completely new and different . . . afford an ease and simplicity of installation never before known with this type of explosion-proof equipment!

Expansion adjustment is built-in! The *two* moving parts telescope or expand to accommodate usual thread lengths. Only *two* tightening operations . . . each made separately! Smaller external diameters for convenient use in restricted quarters! Precision construction for absolute explosion-proof protection . . . no need to worry about failure to draw surfaces together . . . the union remains completely explosion-proof at all times, regardless of its retracted or extended position! Special design guarantees positive ground at all times!

Get acquainted with the *extra* quality and utility built into APPLETON Explosion-Proof Expansion Unions. Write for complete details.

Sold Exclusively Through Selected Wholesalers

APPLETON ELECTRIC COMPANY
1704 Wellington Avenue · Chicago 13, Illinois

Also Manufacturers of:

Rely on **APPLETON** *. . . The Standard for Better Wiring*

Published for electrical contractors, industrial electricians, engineers, consultants, inspectors and motor shops. Covering engineering, installation, repair, maintenance and management, in the field of electrical construction and maintenance.

ELECTRICAL CONSTRUCTION AND MAINTENANCE

with which is consolidated Electrical Contracting, The Electragist and Electrical Record — Established 1901

54th Year **FEBRUARY • 1955**

At a Glance 5

Washington Report 7

Atoms for Power, *An Editorial* 65

Lighting Competition for Electrical Contractors 67
Report on the six First Prize Awards in the 1954 Lighting Competition sponsored by *Electrical Construction and Maintenance.*

Contractor Displays Lighting for Living in Own Home 68
Jerry F. Burt, Burt Electric Co., Fallbrook, Calif.

Office Lighting Implements Interior Design 72
John O. Kvalsten, Kvalsten Electric Co., Inc., Minneapolis, Minn.

Floodlighting Helps Sell Used Cars 75
Mahlon Miller, Phoenixville, Pa.

Product Quality Improved by Windowless Plant Lighting 77
John G. Zimmerman, Zimmerman & Walsh, Quarryville, Pa.

Bank Modernization Features New Lighting 80
Ellsworth C. Harper, Jr., Sanford Electric Company, Sanford, Fla.

Incandescent Lighting Helps Sell Fabrics 82
Milton W. Stratton, Independent Wiring Co., Philadelphia, Pa.

Power for Steel Fabrication 85
By FRANK PRATTINI—High voltage distribution is the backbone of complete modernized electrification for steel fabrication at the plant of Orleans Material and Equipment Co., New Orleans, La.

Electric Heating—The Trend is Upwards 86
By M. J. LAMPERTI—Some practical suggestions for promoting, designing, selecting, installing and operating electric heat.

Operation of Isolated Ground System 92
Installation in surgical wing of St. Clare's Hospital, Denville, N. J., is typical of ground-detection circuits designed to guard against explosions in anesthetizing locations.

At the Test Bench—9 94
By W. J. PRISE—DC motor testing with an electronic growler.

Sectional Catwalks Aid Plant Relighting 96
By H. P. SCOTT—To avoid scaffolding in production areas Schwartz and Lindheim of Oakland devised sectional catwalks swung between trusses, then worked from elevated walk-ways to install new continuous rows of 3-lamp fluorescent fixtures.

MORE

FEBRUARY • 1955 *continued*

Productive Maintenance Part II 98

Equipment vital to production should be backed by stock of spare parts, the extent of inventory being dictated by equating cost of repairs to overall cost of a production shutdown.

Practical Methods 109

Strip heaters boost concrete vault production; maintenance boosts battery life by 50%; drill press on skids used as a hole cutter.

Motor Shops 119

Car trailer doubles as sales and advertising aid; pipe extension increases capacity of dipping tank; shop-made coil cutter.

Reader Service 131

Product news announcements, catalogs and bulletins.

Reader's Quiz 164

Questions and answers on electrical maintenance; fused disconnect switches; protecting 3-phase motors.

Questions on the Code 171

Answers to code questions including auxiliary gutter problem; disconnect switch; grounding and non-metallic sheathed cable.

Modern Lighting 181

Colonial-period church combines 19 lighting mediums; relighting enhances study hall; translucent modules for office installation.

New Methods of Rapid Tax Depreciation 186

By W. F. STANLEY—A discussion of your rights under the rapid depreciation allowances of the new tax law.

In the News 193

Dates Ahead 204

W. T. STUART, *Editor*

Alice McMullen, *Associate Editor*

Berlon C. Cooper, *Eastern Editor*

August Eckel, *Middle West Editor*

Hugh P. Scott, *Industrial Editor*

J. F. McPartland, Jr., *Assistant Editor*

W. J. Novak, *Assistant Editor*

John P. Reynolds, *Assistant Editor*

Harry Phillips, *Art Editor*

Ray Ashley, B. A. McDonald, Walter J. Prise, Glenn Rowell, B. Z. Segall, *Consulting Editors*

W. A. Cyr, *Western Consultant*

Dexter Keezer, *Dir. Economic Staff*

George B. Bryant, Jr., *Chief Correspondent, Washington Bureau*

John Wilhelm, *Editor, World News*

W. W. GAREY, *Publisher*

C. B. Shaw, *Advertising Sales Manager*

District Managers

A. B. Conklin, *New York*

S. A. Jones, *New York*

E. P. Gardner, *Philadelphia*

F. J. Seiler, *Cleveland*

R. A. Hubley, *Detroit*

Charles F. Minor, Jr., *Chicago*

R. R. Ream, *Chicago*

T. H. Carmody, *San Francisco*

C. W. Dysinger, *Los Angeles*

J. H. Cash, *Dallas*

W. D. Lanier, *Atlanta*

Member of
AUDIT BUREAU OF CIRCULATIONS and ASSOCIATED BUSINESS PUBLICATIONS

Vol. 54, No. 2 **ELECTRICAL CONSTRUCTION and MAINTENANCE** **February 1955**

Published monthly with an additional issue in September by McGraw-Hill Publishing Company Inc. James H. McGraw (1860-1948), Founder. Publication Office, 99-129 North Broadway Albany 1, N.Y.

Executive, Editorial and Advertising Offices: McGraw-Hill Building, 330 W. 42nd St., New York 36, N. Y. Donald C. McGraw, President; Willard Chevalier, Executive Vice-President; Joseph A. Gerardi, Vice-President and Treasurer; John J. Cooke, Secretary; Paul Montgomery, Executive Vice-President, Publications Division; Ralph B. Smith, Vice-President and Editorial Director; Nelson Bond, Vice-President and Director of Advertising; J. E. Blackburn, Jr., Vice-President and Director of Circulation.

Subscriptions: Address correspondence to Electrical Construction and Maintenance—Subscription Service, 99-129 N. Bway., Albany 1, N.Y. or 330 W. 42nd St., New York 36, N.Y. Allow one month for change of address.

Subscriptions are solicited only from persons engaged in electrical construction or electrical maintenance. Position and company connection must be indicated on subscription orders.

Single copies 35c. Electrical Products Guide $2.50 to those in the electrical construction and maintenance industry. Subscription rates—United States and possessions, $3.00 a year; $4.00 for two years. Canada, $5.00 a year; $8.00 for two years. Other Western Hemisphere and Philippines, $10.00 for one year; $16.00 for two years. All other countries, $15.00 a year. Three-year rates, accepted on renewals only, are double the one-year rate. Entered as second class matter August 29, 1938 at the Post Office at Albany, N.Y., under act of Mar. 3, 1879.

Printed in U.S.A. Copyright 1955 by McGraw-Hill Publishing Co., Inc. — All Rights Reserved.

FEBRUARY . . . . *at a Glance*

ELECTRIC HEAT PRACTICE – Improved equipment, installation techniques and technical data are rapidly expanding the opportunities for efficient and economical applications of electric space heating. Practical experience with a growing number of installations is piling up a body of factual data bearing on design capacities, control and operating costs which has already rendered obsolete much traditional criteria based upon fuel-fired system experience.

Many electrical contractors are discovering that electric space heating sales and installation are a new, interesting and profitable line of business. Public acceptance is growing. Those contractors who are now going out after electric heating customers are laying up a valuable fund of practical experience and know-how in a field which is destined to become one of the greatest markets for the electrical industry.

Mario J. Lamperti, president of North Bay Electric Works, Inc. in San Rafael, Calif., was one of the first electrical contractors in his area to recognize the growth potential of electric space heat. Now, with a substantial stockpile of design and installation experience with a variety of methods and equipments, he is widely recognized as an authority on the practical application of electric space heat.

In "Electric Heating–the Trend is Upwards," beginning on page 86, Mr. Lamperti gives a number of practical suggestions, out of long experience, for promoting, designing, selecting and operating modern electric heating systems.

SCHOOLS TOO–What about electric heat for schools? To provide some answers a group of manufacturers and contractors sought the cooperation of school authorities to set up a modernized classroom in one of Chicago's schools.

The room will be used as a display of modern classroom facilities and furnishings to permit school officials to study these features in actual use. It will also provide valuable information on operation and costs for architects and engineers.

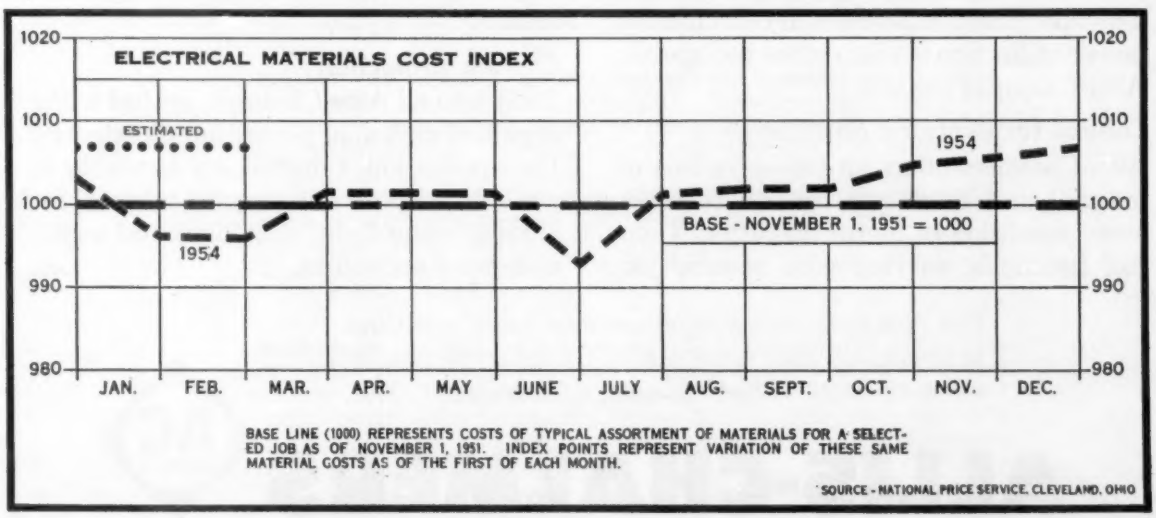
Most significant features are the lighting, heating and ventilation. They are all-electric and self-contained. Heat is radiated from electric resistance panels in the ceiling. Resistance elements in the unit ventilator heat the incoming and circulating air. A newly designed electronic thermostat provides precise control.

From preliminary estimates it looks like the all-electric classroom, by eliminating structural costs, heating plants and systems, and reducing custodial and maintenance costs can save the taxpayer substantial sums. The Chicago "laboratory classroom" is one that should be duplicated in many other cities. It is well within the practical capabilities of local industry groups and, in view of the current school building program, could be a vitally important public service.

ISOLATED GROUND–Much progress has been made in recent years on electric system designs for hospital operating rooms. The Code now requires a special ungrounded supply with a sensitive ground contact indicator. The installation of such systems reduce electric shock and ignition hazards in areas where volatile anesthetics are used.

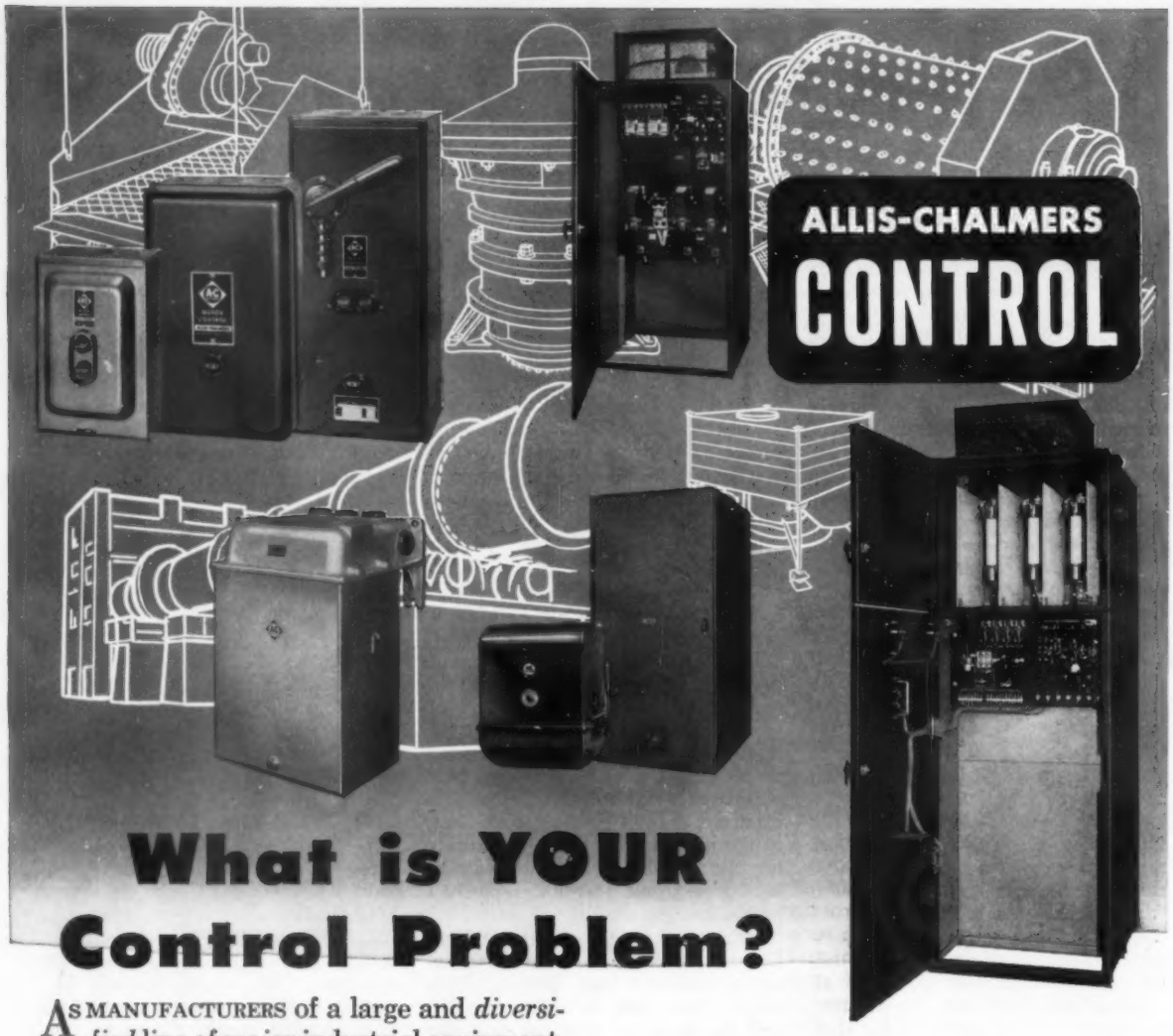
A case study of a practical installation of an isolated ground system is presented, beginning on page 92, in a description of the installation and operation of such a system in the surgical wings of St. Clare's Hospital in Denville, N. J.

THE WINNERS–First prize winning entries in the Lighting Competition for Electrical Contractors, sponsored by "Electrical Construction and Maintenance" in conjunction with Light's Diamond Jubilee are presented in this issue beginning on page 67. Seventeen cash awards totaling **$1,300.00** and five honorable mentions were awarded by the judges to electrical contractors in ten states and Canada.



BASE LINE (1000) REPRESENTS COSTS OF TYPICAL ASSORTMENT OF MATERIALS FOR A SELECTED JOB AS OF NOVEMBER 1, 1951. INDEX POINTS REPRESENT VARIATION OF THESE SAME MATERIAL COSTS AS OF THE FIRST OF EACH MONTH.

SOURCE - NATIONAL PRICE SERVICE, CLEVELAND, OHIO



What is YOUR Control Problem?

AS MANUFACTURERS of a large and *diversified* line of major industrial equipment, Allis-Chalmers has been called upon to solve thousands of control application problems in practically every industry. This specialized experience in coordinating power utilization is *yours* when you specify Allis-Chalmers control.

Control for every ac application

Allis-Chalmers offers an extensive line of manual and magnetic control to meet every condition of motor operation. Control functions, varying with specific job requirements, include full or reduced voltage starting, acceleration, speed control, reversing or non-reversing, and dynamic braking.

Custom protection

Built into all Allis-Chalmers control is the type and degree of protection dictated by the application. Controls are available in general purpose and special cabinet, including water-tight, dust-tight and explosion-proof enclosures. A-4516

For complete information on any specific control problem, call your nearby Allis-Chalmers representative or write Allis-Chalmers, Milwaukee 1, Wis.

ALLIS-CHALMERS

Washington Report

A census of U. S. business, first general survey of all types of businesses in 15 years, is now under way. U. S. Census Bureau was allotted $8 million to questionnaire over three million U. S. enterprises, including 275,000 manufacturing establishments, about three million retail, wholesale and service enterprises, and 35,000 mines, quarries, oil and gas operations. Facts wanted about each firm will include: number of employees, wage rates, raw materials used, and quantities, electric power and fuel consumed, type of organization, how much spent on new equipment and plant expansion, etc. Facts developed will aid Government economists in business forecasts, also will be available to industry for planning sales and advertising campaigns, planning new expansions, seeking new markets, and similar purposes.

Steel production had stabilized at 80%-plus of January 1, 1955 capacity of 125.8 million net tons over the December-January period, and topped two million tons during second week of January for first time since November 1953. Steel executives predict first quarter operations will average out at about this same rate.

Aluminum output in the U. S. during 1954 totaled about 2.9 billion pounds, up 16% over the 1953 record output.

Copper supplies in U. S. are tight, due to strikes here and in Chile last year, a January strike at Northern Rhodesia mines, and the cut-off of 4,000-6,000 tons of copper due to shutdown of big copper smelter at El Paso, Texas for repairs. Demands rose sharply in January on fear of price rise.

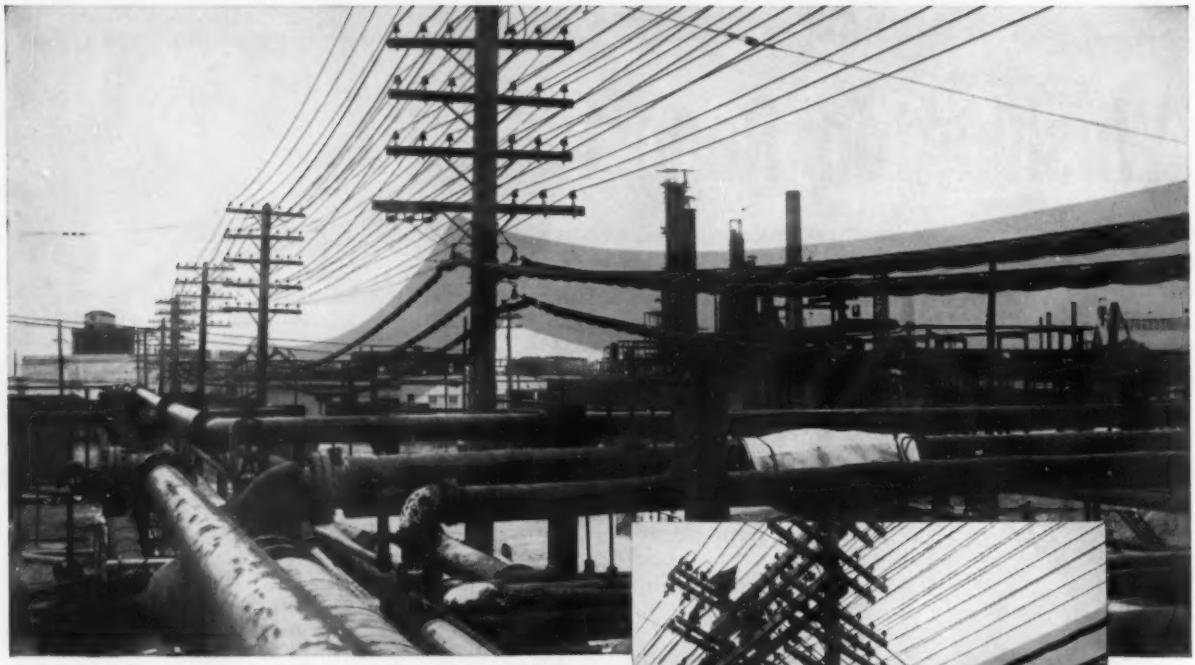
Production capacity for fractional hp motors and generators by American manufacturers is sufficient to provide all military and essential civilian needs in event of full mobilization, according to report of a task group of the Fractional Horsepower Motor and Generator Industry Advisory Committee at a recent meeting of that group with the Business and Defense Services Administration, Dept. of Commerce. This conclusion was reached after a year of study in which all available information from Government sources was carefully reviewed. Ten of the Committee's eleven members were present at the meeting, presided over by Clark M. Wright, Director, Electrical Equipment Division, BDSA.

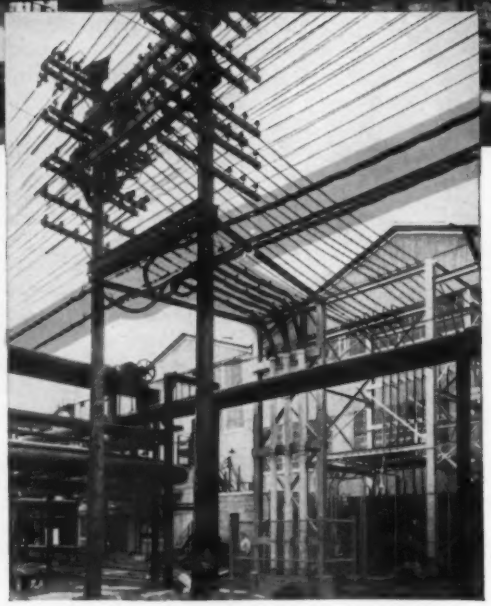
Electric power generating capacity at end of 1954 was 102 million kilowatts, up 10 million kw from a year earlier, and more than double the 50-million-kw 1946 capacity. Production at year-end was at weekly rate of about 9.8 billion kilowatt-hour average.

Another new record in construction activity is predicted by Depts. of Commerce and Labor experts for this year. They calculate that $39.5 billion of new construction will be put in place, as compared with 1954's record high of $37.2 billion. They expect privately financed work to increase 7% over last year, publicly financed projects to be up 5%. Last year's total was 5% above the 1953 level of $35.3 billion, and was the eighth year in a row in which construction activity set a new record high.

Housing starts in 1954 rose to 1,215,000, or 10% more than 1953's 1,103,800 starts. This was second only to the 1950 record of 1,396,000 starts of public and private housing units.

Statistics on construction, currently a $50-billion industry accounting for about 15% of our Gross National Product, and the nation's largest single industry, are now published in "Construction Review", a new joint monthly publication of the Depts. of Commerce and Labor. It is available from Superintendent of Documents, Government Printing Office, Washington 25, D. C., at $3.00 per year.





1. New Okolite-Okoprene 13.2 kv self-supporting aerial cables take little space on heavily crowded poles at the Gulf Oil Corporation's Philadelphia Refinery.
2. Primary distribution circuits in conduit leaving substation and rising in conduit to poles.

REFINERY EXPANDS POWER DISTRIBUTION with OKOLITE-OKOPRENE SELF-SUPPORTING CABLES

A major increase of power line capacity utilizing heavily crowded existing poles at the Gulf Oil Corporation refinery in Philadelphia was made possible by the use of Okolite-Okoprene self-supporting aerial cables. The 15 kv shielded construction permitted easy, rapid installation despite the presence of "hot" lines on the poles which could not be shut down during the job.

The neat appearance, increased safety and space savings obtained through the use of self-supporting aerial cables are evident in this installation. In addition, simplicity of installation and ease of handling mean lower construction costs. Okolite-Okoprene is also well known for its resistance to weather extremes, moisture, most oils and greases, and the common acids and alkalies.

Write for Bulletin EC- 1074, for detailed information on Okolite-Okoprene self-supporting aerial cables to The Okonite Company, Passaic, N. J.

Electrical Contractors:
W. V. Pangborne and Co., Inc.

OKONITE SINCE 1878 ***insulated cables***

2282

FINANCIAL AID TO HIGHER EDUCATION

Business Aid for Our Colleges—Voluntary or Involuntary?

Previous editorials in this series have shown that:

- As a group the nation's independent, privately endowed colleges and universities are in grave financial trouble, and
- There are many different means by which business firms can extend a helping hand to these institutions.

This editorial, one of a series devoted to the financial problems of higher education, submits this proposition: **If business firms do not voluntarily go to the financial aid of higher education, there is every prospect that they will soon be providing more financial support for higher education involuntarily, through taxation.**

If this prospect materializes, one of the basic elements of a well-balanced system of higher education—a strong array of independent colleges and universities—may well be dangerously weakened if not destroyed. And in the process a potentially crucial bulwark for freedom of enterprise in the United States—that same strong array of independent colleges and universities—will be undermined.

Acceptance of these propositions implies absolutely no disparagement of tax-supported colleges and universities. These have an indispensable role in the total system of higher education in the United States. Leaders of these institutions would be among the first to agree that their position is strengthened by a strong system of independent institutions, supported privately rather than by political agencies.

What is the evidence that in one way or another, voluntarily or involuntarily, business will be giving more financial support to higher education? One impressive part of this evidence is provided by the recent rapid increase in the proportion of college and university students attending tax-supported institutions.

Rapid Shift in Enrollment

In the fall of 1952 tax-supported colleges and universities enrolled about 7.5 per cent more students than the independent institutions. In 1953 this percentage was doubled. And in 1954 the tax-supported institutions enrolled 26 per cent more students.

In the case of students entering college for the first time the relative growth of the tax-supported institutions recently has been even more striking. In 1952, the number of beginning students in the tax-supported schools, as reported by the U. S. Office of Education, exceeded those in the independent colleges and universities by 35 per cent. In 1954, just two years later, this figure jumped to 49 per cent.

Why has the proportion of students attending tax-supported colleges and universities been in-

creasing so rapidly? There are many reasons. But a dominant reason is that, in order to keep going at all, the independent institutions have been forced to make large increases in the prices they charge for instruction. The purchasing power of their endowment funds has been cut in half by price inflation. The capacity of the wealthy to supplement their endowments by gifts, as they have done in the past, has been greatly reduced by high taxes. As a result these schools have been forced to rely increasingly on higher prices for instruction (tuition as it is called in academic circles) to make both ends meet.

Since 1940, the independent colleges and universities have raised their tuition fees by an average of about 60 per cent. This is considerably less than the increase of about 100 per cent in prices generally since 1940. And it is nowhere near enough to prevent the faculty members of the independent colleges from faring miserably in terms of salaries, a matter of major national importance to which we shall return in this series. But the increase in tuition fees of the independent colleges has been much greater than the increase in the fees charged by the tax-supported schools. And that price differential increasingly tends to shunt students into the schools which are supported chiefly by taxes. Independent colleges now charge, on the average, about $580 per year for a full course of instruction while the tax-supported institutions charge, on the average, about $240.

Bigger Tax Bill in Prospect

A large increase in the total enrollment in our colleges and universities during the next decade is in prospect, particularly when the great increase in births during World War II is reflected in the number of young men and women of college age. With a total of 2.5 million students at present enrolled in our institutions of higher learning, it is estimated that the total will be over 3 million by 1960.

If this trend continues most of the anticipated increase in college and university enrollment will be concentrated in tax-supported institutions. Indeed, if the shift toward tax-supported institutions that has occurred in the last three years were to continue over the next six years at the same rate, about two million of the three million students anticipated in 1960 would be in tax-supported colleges and universities and one million in independent schools. In 1950 there was a 50-50 division in enrollment. This shift would mean, of course, a corresponding increase in the tax bill for tax-supported education. And of this bill, we can be sure that an ample share would be assessed against business firms.

No Easy Solution

The best way, of course, to put a brake on a soaring tax bill for higher education is to help the independent institutions get in shape financially to carry a larger share of the student load. For most companies the development of a mutually satisfactory program of financial aid for higher education is a complicated process. In fact, it is so complicated that some companies with an initial disposition to provide financial help are inclined to despair of working out a mutually constructive plan.

If, however, the leaders of business will contemplate seriously the only available alternative to their extending voluntary help to our independent colleges and universities, their determination to work out a plan will be strengthened. For that alternative involves a grave weakening of our system of higher education, together with an involuntary increase in the financial support of higher education by business. The increase would come through higher taxes. Contemplation of such an alternative should, if necessary, toughen the will of business firms generally to do everything possible to extend financial help to our independent colleges and universities.

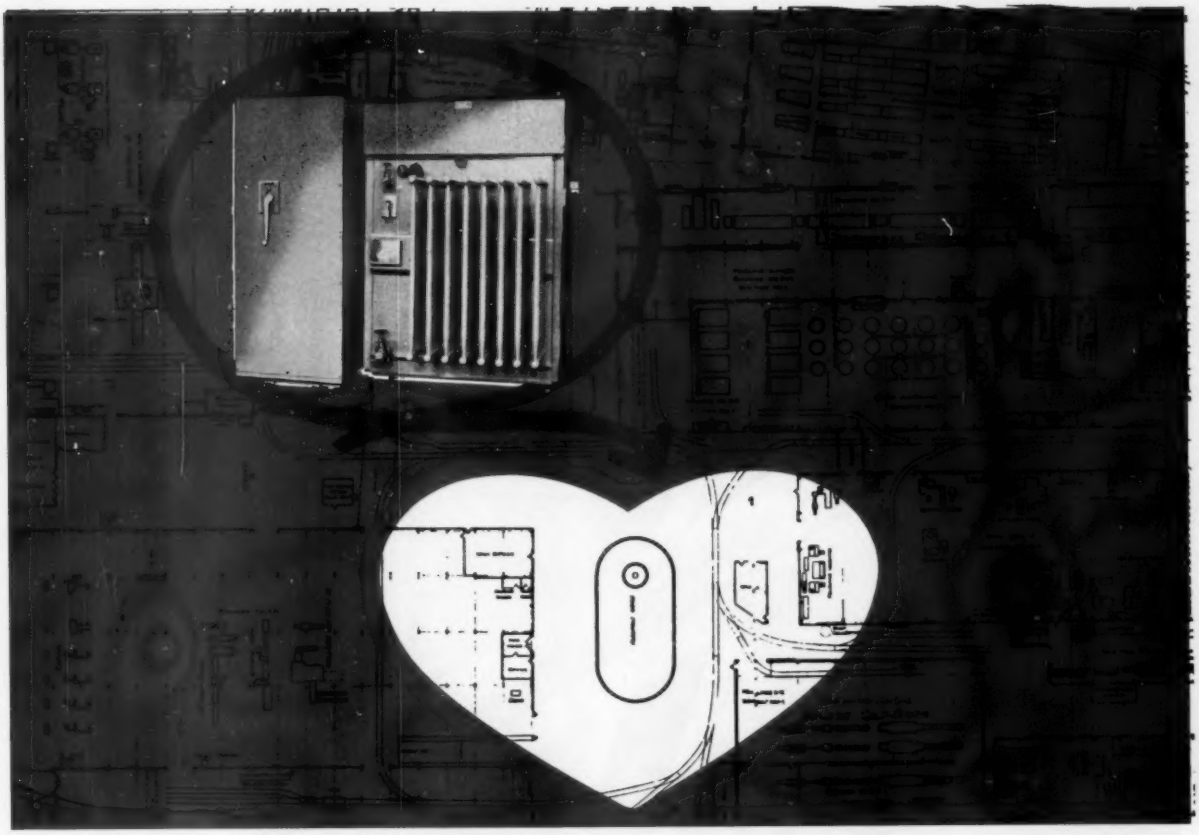
This message is one of a series prepared by the McGraw-Hill Department of Economics to help increase public knowledge and understanding of important nationwide developments that are of particular concern to the business and professional community served by our industrial and technical publications.

Permission is freely extended to newspapers, groups or individuals to quote or reprint all or parts of the text.

Donald C. McGraw

PRESIDENT

McGRAW-HILL PUBLISHING COMPANY, INC.



In the "heart" of the plant...

an UPTEGRAFF LOAD CENTER TRANSFORMER

reduces costs...improves power characteristics

Uptegraff announces a complete line of *Liquid Filled* LOAD CENTER TRANSFORMERS—150 KVA to 2500 KVA, 3 phase—designed for convenient installation with various types of switching equipment and terminal arrangements.

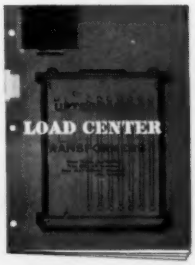
The use of Uptegraff Load Center Transformers offers savings up to 15 per cent as compared to the practice of using remote outdoor transformers to supply low-voltage power to machines and equipment located indoors. With load center transformers, costly low-voltage runs are kept to the minimum, and power characteristics are improved.

Uptegraff Load Center Transformers are designed and built specifically for this class of service. In addition to savings in installation costs, they offer substantial economies through operating efficiency. They are dependable and require the minimum of maintenance.

R. E. Uptegraff Manufacturing Co.

Scottdale, Pennsylvania

NEW HANDBOOK



The new Uptegraff Load Center Transformer Handbook simplifies the selection of a suitable unit, including auxiliary terminal equipment to provide the facilities you require. It gives overall dimensions and weights (including terminal devices, etc.) for all ratings from 150 to 2500 KVA,—3 phase. Write for a free copy. The coupon below is included for your convenience.

R. E. Uptegraff Manufacturing Company
Scottdale, Pennsylvania

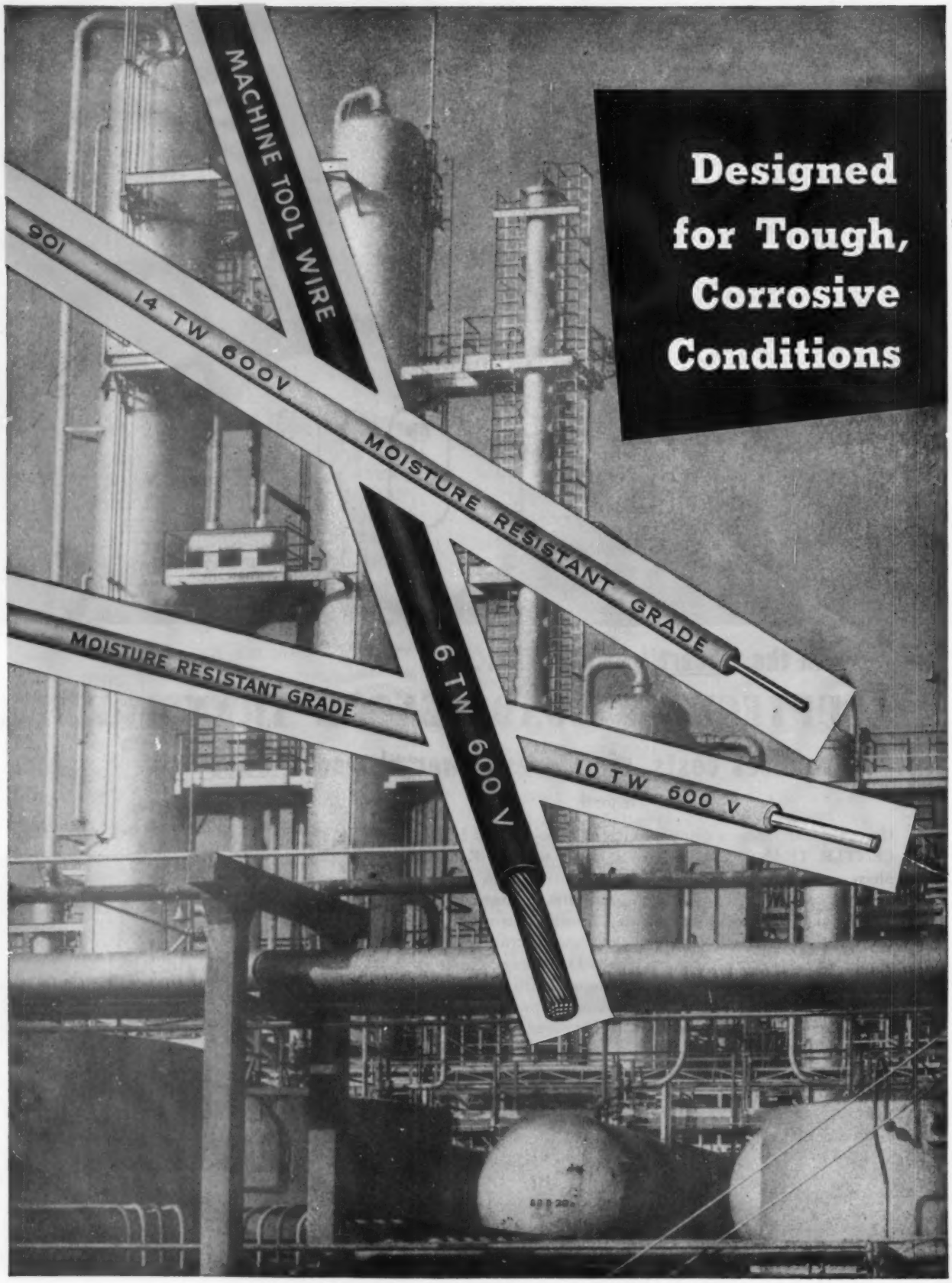
Please send a copy of your LOAD CENTER TRANSFORMER brochure, Catalog 132, to:

Name _____ Position _____

Company _____

Address _____

ECM-2


Designed for Tough, Corrosive Conditions
MACHINE TOOL WIRE
901
14 TW 600V
MOISTURE RESISTANT GRADE
MOISTURE RESISTANT GRADE
6 TW 600 V
10 TW 600 V

Rome Synthinol®

WIRES AND CABLES

Whenever you are selling or installing plant wiring, you'll find Rome Synthinol thermoplastic insulated wires and cables are sure to build your reputation for handling quality products. They are manufactured to withstand tough, corrosive conditions like those encountered in the chemical or petroleum industries.

This rugged, polyvinyl chloride type insulation has proven its ability to resist acids, moisture, abrasions, corrosive fumes, flame, oils and cutting solutions. Colors remain permanently clear for quick, easy circuit identification.

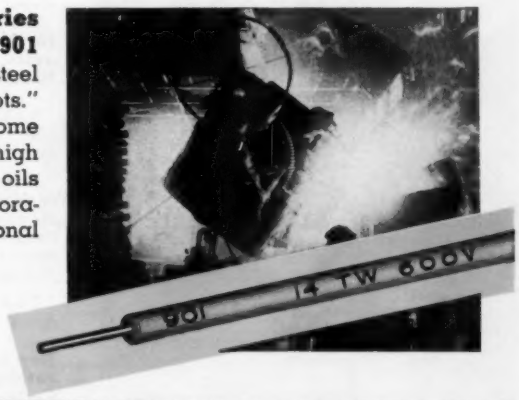
What's more, Rome Synthinol assures quick, easy, economical installation. Its lubricated surface makes it easy to pull. It's easy to strip, too. And, its small diameter, high dielectric strength and exceptional aging characteristics make it ideal for industrial wiring circuits.

Rome Synthinol, Type TW small diameter building wire is approved by the Underwriters' Laboratories for use in wet locations under the rules of the National Electrical Code.

Rome Synthinol Machine Tool and Control Wire has been adopted as standard wiring material by machine tool manufacturers for extreme durability and excellent resistance to heat, oils, acids, alkalies, common cutting solvents, etc. Underwriters' Laboratories approved as Type TW, with end use approval for 80° C. operation in air; 60° C. where exposed to oil and in wet locations. Conforms with National Machine Tool Builders' Assoc. Standards.

For Steel Mills, Chemical Plants, Oil Refineries and Other "Hot Spots" . . . Rome Synthinol 901

Here's the ideal insulation for the equipment wiring of steel mills, chemical plants, oil refineries and other "hot spots." A heat resistant polyvinyl chloride type of insulation, Rome Synthinol 901 provides superior service life under high operating temperatures. It also offers high resistance to oils and chemicals. It is approved by Underwriters' Laboratories as Type TW, for 60°C. operation under National Electrical Code.



Superior Rome wires and cables are stocked at the following warehouse locations:

Atlanta, Ga.	Los Angeles, Calif.
San Francisco, Calif.	Rome, N. Y.
Chicago, Ill.	Salt Lake City, Utah
Dallas, Texas	Seattle, Wash.
Denver, Colo.	St. Paul, Minn.

It Costs Less to Buy the Best

ROME CABLE
Corporation
ROME · NEW YORK
and
TORRANCE · CALIFORNIA

ROME CABLE ROME, N.Y.

ROME CABLE CORP., Dept. EC-2, Rome, N. Y.
Please send me information on Rome Synthinol and Rome Synthinol 901.

Name.....

Company.....

Address.....

City.....*State*.....

Installed in this modern, attractive interior by The McClure Electric Company were 48 2'x2' Beta units and 10 4'x4' Omega units. Both are completely self-contained units with Wakefield's exclusive Rigid-Arch plastic diffusers. Beta is for recessed mounting and Omega for on-surface mounting. Each comes in four sizes: 4'x4', 2'x4', 2'x2' and 1'x4'.

METROPOLITAN BUILDING AND LOAN ASSOCIATION, Dallas, Tex.

Electrical Contractor: McClure Electric Company, Dallas, Texas.

Licensed Agent: General Electric Supply Company, Dallas, Texas.

Contractor used Wakefield units to increase his sales on this job by $3200

It is poor business to try always to sell the cheapest. When you sell the best you make more money. And even more importantly you give your client a better result, one both he and you can be proud of.

In the case of this handsome installation of Wakefield Beta and Omega units, E. J. Whitlow, vice-president of The McClure Electric Company, Dallas, Texas, makes these enthusiastic yet logical comments:

"We are proud of this job. The reputation of Wakefield, the appearance of the fixtures and a little selling on our part all combined to increase our sales on this installation by about $3,200.

"Actually, very little sales effort on our part was necessary. Mr. Gus Berry, President of Metropolitan Building & Loan, has very nice taste. He was immediately sold on the appearance of the fixture and when we explained some of the advantages to him concerning ease of maintenance and some fine construction features he had no hesitancy in recommending to his Board of Directors that the difference be paid for Wakefield over the specified fixture.

"Your Mr. Dan Schisler was very helpful on this job. He went to great trouble to assist us. We congratulate you on your fine representative in this area."

New catalogs on Beta and Omega have recently been prepared. Other new catalogs cover the complete line of Wakefield Geometrics, the Wakefield Ceiling and luminaires of advanced design. Write to The F. W. Wakefield Brass Company, Vermilion, Ohio. In Canada: Wakefield Lighting Limited, London, Ontario.

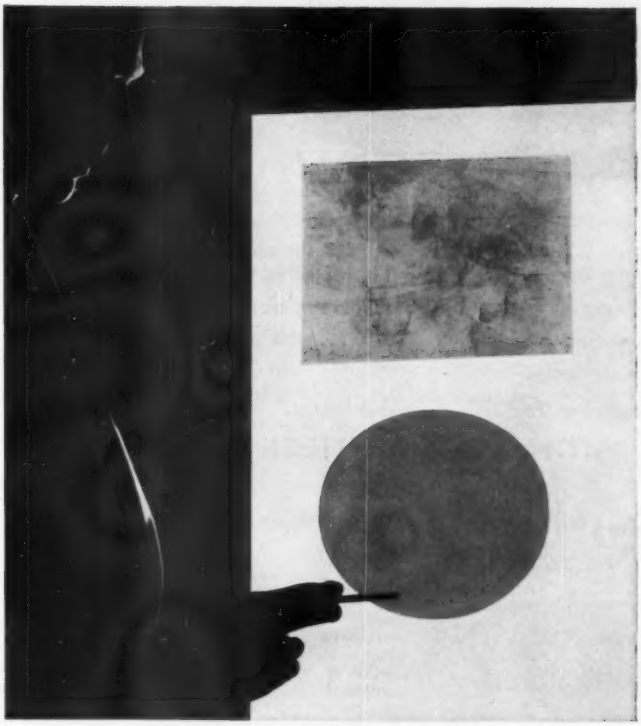
Wakefield Over-ALL Lighting

More power per pound with G-E insulating materials

"WRAP" POWER TIGHTER, LIGHTER...

with uniform, void-free

GE MICA MAT



GREATER UNIFORMITY OF G-E MICA MAT (circle) is shown in contrast to conventional mica insulating sheet.

Here's a revolutionary new form of electrical insulation to help you build lighter, more compact units without sacrifice of dependability or protection: General Electric MICA MAT is dehydrated flake mica in *continuous sheet* form. As much as 10% less MICA MAT gives better performance than present machine- and hand-laid mica products because of its *greater uniformity* and *void-free* construction. Flexible and easy to handle, it helps you get "more power per pound" from motors, generators and other electrical equipment.

MICA MAT products—tapes, wrappings and slot insulation—are available for a wide variety of insulation needs. When backed with glass, cotton cloth, paper or polyester film, and treated with Glyptal®, silicone or other synthetic resins, superior mica products result which make possible new designs with reduced size or increased output rating.

CLIP COUPON FOR COMPLETE TECHNICAL DATA

Progress Is Our Most Important Product

GENERAL ELECTRIC

General Electric Company
Laminated and Insulating Products
Section ECM 1-5, P.O. Box 5911
Cleveland 1, Ohio

Please send me complete technical data on G-E MICA MAT. I want this for: ( ) Reference purposes only ( ) An immediate application on_____

Name_____

Firm_____

Street_____

City_____ Zone____ State_____

NEW KING-SIZE TROFFERS BY GUTH

FOR DRAMATIC "SKYLIGHT" EFFECTS

2 x 4's

A HARMONIOUS BLEND OF BEAUTY AND LIGHTING EFFICIENCY

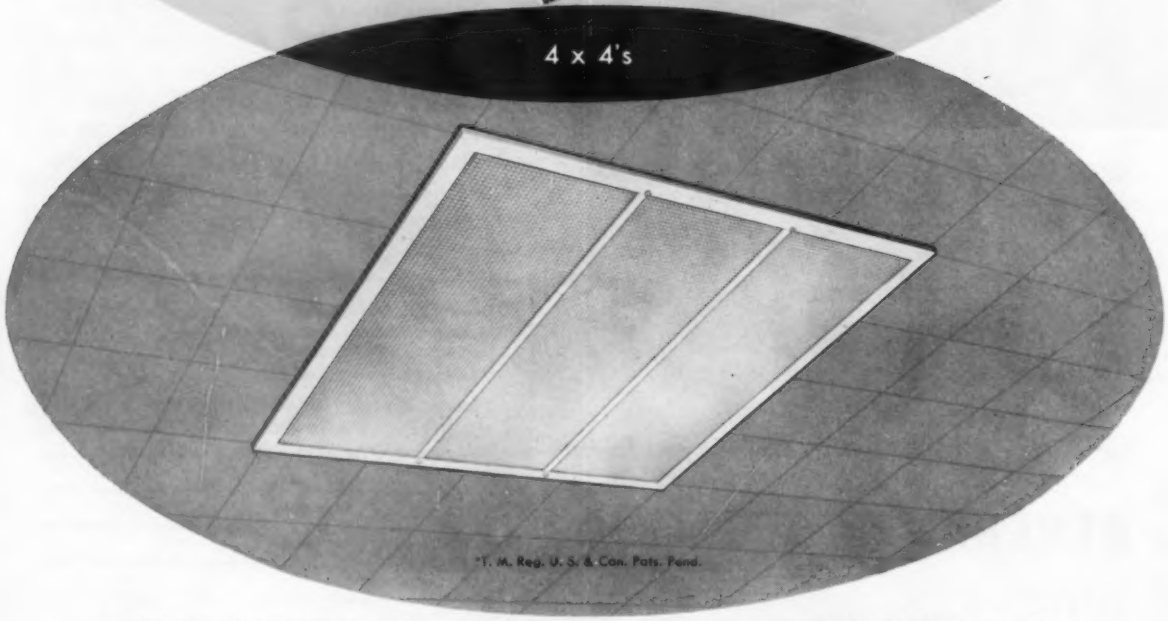
Giant, recessed 2 x 4's and 4 x 4's with all the outstanding Guth Troffer features ...combined with the great *Guth GrateLite* Louver-Diffuser*. They create large luminous islands of efficient fluorescent and Slimline illumination...with excellent shielding and diffusion...low cost maintenance.

They fit easily into any block or tile opening. For 2, 3, 4, and 6 lamps.

THINK OF THE DESIGN POSSIBILITIES!

THE EDWIN F. GUTH CO., ST. LOUIS 3, MO. Guth **TRUSTED** NAME IN LIGHTING SINCE 1902

4 x 4's



*T. M. Reg. U. S. & Can. Pats. Pend.

WRITE ON YOUR LETTERHEAD FOR YOUR COPY OF THE BIG, BRAND NEW GUTH TROFFER CATALOG NO. 50-A

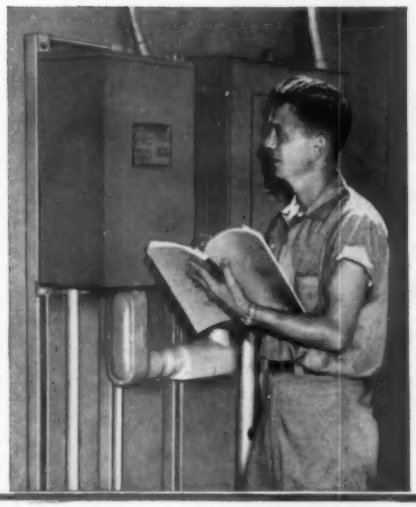
LOOK!

A Dry-Type Transformer with Class H Insulation

(150 C Rise)

Here's a completely new line of totally enclosed dry-type transformers with Class H insulation. Maintenance is completely eliminated. Dust and dirt are kept out. No more worrying about the effect of lint or moisture in the atmosphere. You can use them indoors or outdoors — they are completely weatherproof. And the compact Allis-Chalmers design gives you lower weights, reduced dimensions. In many cases installation will be less costly, easier.

All these advantages at little or no extra cost!



Best of all, there is no increase in cost in ratings 10 kva and below, single phase, and 30 kva and below, three phase. A slight increase in cost of higher ratings is more than offset by the many new advantages.

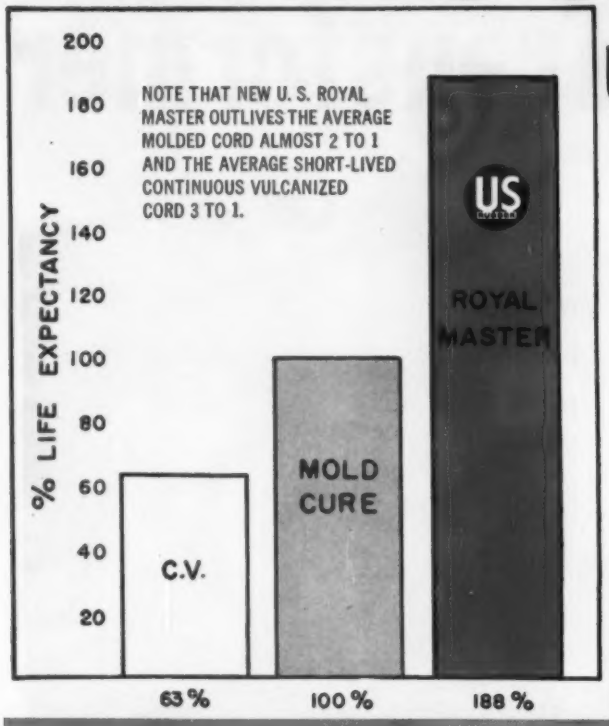
The tank is simple and sturdy — it has four formed corners and only one welded seam. The bottom plate is recessed and held to the case by bolts for quick removal. The coil is given maximum protection with expensive Class H insulating materials. The unit is designed for 150 C rise. The result is a convenient, compact transformer that will give years of satisfactory operating life.

For more information call your nearby Allis-Chalmers distributor or district office, or write Allis-Chalmers, Milwaukee 1, Wisconsin. A-4529

ALLIS-CHALMERS

Now...88% longer

U.S. ROYAL



Chart—summarizing individual service factors weighted by their contribution to overall service life—shows new U. S. Royal Master Cord gives 88% longer life than the average of competitive molded cords.

LOOK FOR THE NAME—

U.S. ROYAL MASTER

Superior on every count!*

- 33.3% greater heat resistance
- 55.7% greater impact strength
- 53.8% greater abrasion resistance
- 30.6% greater resistance to cutting
- 110.3% greater resistance to tearing
- 21.2% greater tension or breaking strength
- 23.3% greater oil resistance
- 128.8% greater flexibility

*to the average of molded cords of other makes

US RUBBER

UNITED STATES

ELECTRICAL WIRE AND CABLE DEPARTMENT

cord life—with NEW MASTER portable cord!

Far outlasts *any* other cord made!

Service to cost ratings show new U. S. Royal Master Cord actually gives $1.88 in value for every cord dollar when compared to the average competitive molded cord!

Two years ago, "U. S." engineers began a *complete reexamination* of portable cord construction, service life, and the causes of cord failure.

Over 10,000 tests were made. More than a thousand cords of all leading makes, including our own famous U. S. Royal Cord, were analyzed, tested, and compared.

Every life factor was considered and carefully evaluated, alone and in its relation to overall cord performance and service life.

Backed by 64 years of experience in the manufacture of electrical wire and cable, U. S. Rubber engineers then translated their findings into an entirely new portable cord, designed to surpass any other previously made.

Extensive tests, both in the laboratory and in outside plant installations have proved this new portable cord startlingly superior in every respect!

New U. S. Royal Master is unquestionably the finest cord you can buy!

From every standpoint, new U. S. Royal Master is a finer, more durable cord — actually gives 88% longer life than the average of other molded cords — far longer than *any* other cord — surpassing even a *hypothetical* cord incorporating the best features of all those tested!

Far greater value, too! In spite of almost doubled service life, this great new cord is in the same price category as other molded cords—giving you $1.88 in cord value for every cord $1.00!

Prove to yourself the outstanding superiority of new U. S. Royal Master Portable Cord—in both service life *and* economy! Write address below for FREE descriptive booklet illustrating the superiority of the U. S. Royal Master Cord. And get in touch with your "U. S." distributor today!

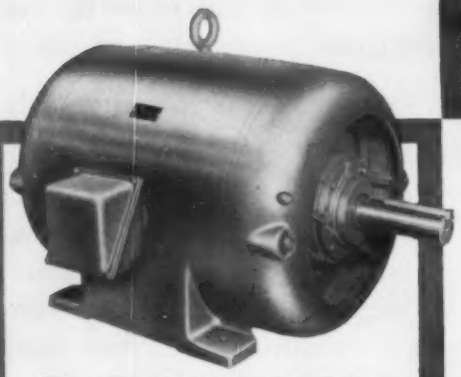
Approved by Underwriters' Laboratories, Inc.

RUBBER COMPANY

ROCKEFELLER CENTER, NEW YORK 20, N. Y.

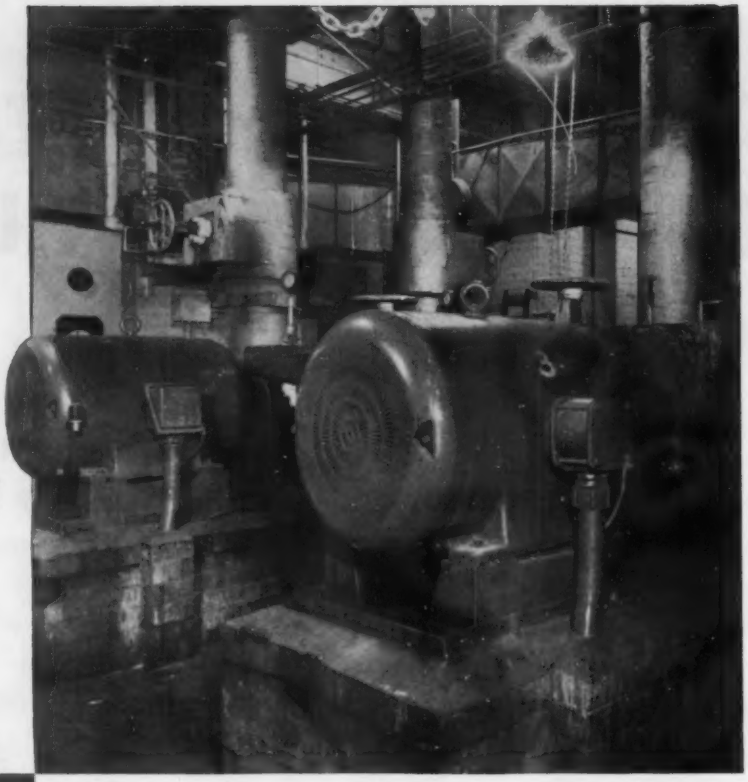
Wagner®
ELECTRIC MOTORS
...the choice of leaders in industry

use
WAGNER
Cast Iron Frame
Motors for
EXTRA PROTECTION
in corrosive
atmospheres



Type EP, totally-enclosed fan-cooled. Available in ratings from 2 to 250 hp.

Type JP, non-ventilated. Explosion-proof. ½ through 1½ hp.



These 150 hp Wagner Cast Iron Frame Motors drive brine pumps in an acid area at Celanese Corporation's Rock Hill, S. C. plant.

If the motors in your plant are subjected to corrosive fumes and liquids, Wagner Cast Iron Frame Motors will provide the *extra protection* you need.

These stock motors are totally-enclosed in corrosion-resistant cast iron. All parts exposed to the atmosphere are fabricated of corrosion-resistant material—even the nameplate. Features include completely protected laminations . . . special varnish treated windings . . . a running shaft seal.

Wagner Cast Iron Frame Motors are available in fan-cooled standard and explosion-proof types in ratings from 2 to 250 hp, and in non-ventilated standard and explosion-proof types in ratings from ½ through 1½ hp. Wagner Bulletin MU-132 gives complete information.

A skilled Wagner engineer will help you select the Wagner Motor to meet your most exacting specifications. Call the nearest of our 32 branch offices, or write us.

Wagner Electric Corporation
EST. 1891

WAGNER ELECTRIC CORPORATION
6413 PLYMOUTH AVE., ST. LOUIS 14, MO., U.S.A.

BRANCHES AND DISTRIBUTORS IN ALL PRINCIPAL CITIES

ELECTRIC MOTORS
TRANSFORMERS
INDUSTRIAL BRAKES
AUTOMOTIVE BRAKE SYSTEMS—AIR AND HYDRAULIC

M53-7

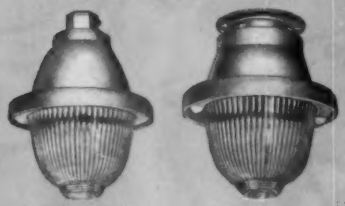
the finest INSIDE OUTSIDE decorative light on the market

... Available Through Your KILLARK Distributor

THE NEW **KILLARK** *Dekorative Light*

Choice of 3 Styles:

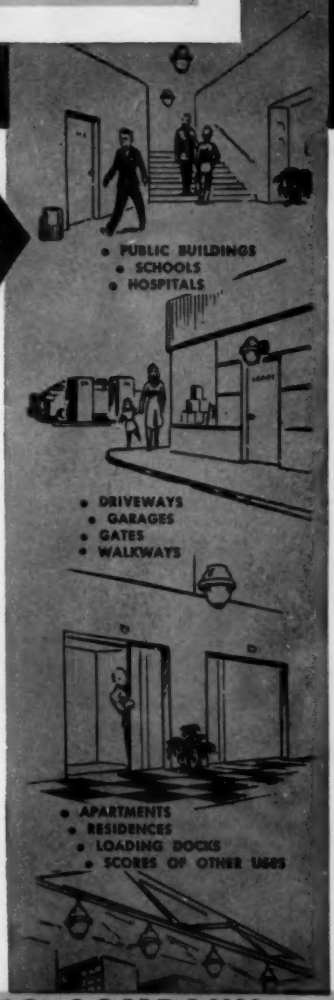
BRACKET (shown above)



PENDANT **CEILING**

Easily Relamped Without Tools

YOU SEE THEM EVERYWHERE



HANDSOME, FUNCTIONAL DESIGN

Perfect for industrial, public and residential applications where ordinary vapor-proof fixtures may be considered too plain or unattractive. Smooth, modern lines . . . easy-to-clean design . . . non-staining satin-like Alumalloy that will retain its "just installed" look for years and years.

STURDY CONSTRUCTION FEATURES

Install it, forget it! Constructed throughout of non-rusting, non-corroding Alumalloy . . . strong, smooth, lightweight. Protected from all kinds of weather by Neoprene Gasket Seal.

KILLARK ST. LOUIS

Killark

ELECTRIC MANUFACTURING COMPANY

ENTRANCE FITTINGS • CONDUIT BODIES • FLUSH SWITCH FITTINGS • EXPLOSION-PROOF FITTINGS • VAPOR-TIGHT LIGHT FIXTURES • EXPLOSION-PROOF LIGHT FIXTURES • SEALED BEAM FIXTURES

Vandeventer & Easton
St. Louis 13, Missouri

SALES OFFICES and WAREHOUSE STOCKS	ATLANTA	69 Mills S., N. W.	DALLAS	1903 Griffin St.	PHILADELPHIA	2014 Chancellor St.
	BOSTON	49-51 D St.	DENVER	1073 Galapago	PITTSBURGH	50 26th St.
	BUFFALO	278 Johnson St.	DETROIT	8319 Mack Ave.	SAN FRANCISCO	714 Harrison St.
	CHICAGO	1528 West Adams St.	LOS ANGELES	412 Seaton St.	SEATTLE	4130 First Ave., S. W.
SALES OFFICES	BALTIMORE	11 W. 25th St.	COLUMBUS	2700 E. Main St.	MINNEAPOLIS	826 Andrus Bldg.
	CINCINNATI	49 Central Ave.	KANSAS CITY, MO.	616 W. 26th St.	NEW YORK	600 W. 181st St.

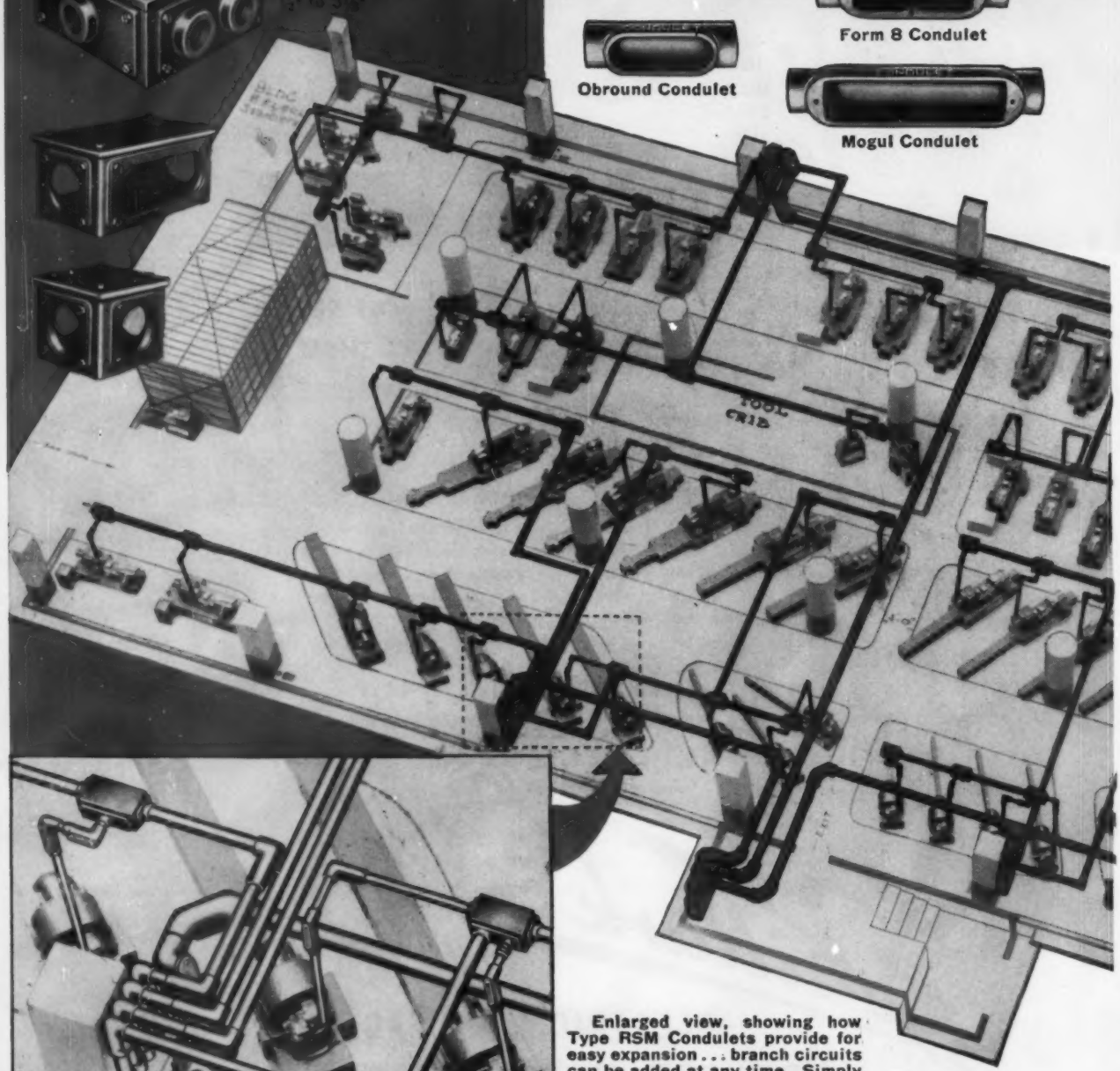
for MODERN WIRING... the CONDULET* and rigid

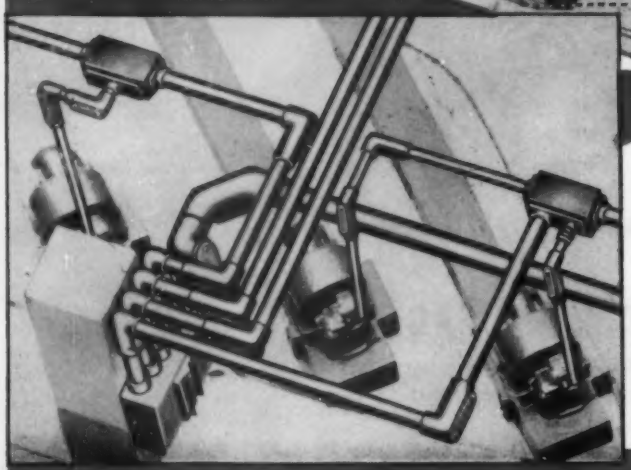
RS Series Junction Condulets take detachable hub plates with 1, 2, or 3 hubs for conduit from ½" to 3½"

Form 8 Condulet

Obround Condulet

Mogul Condulet



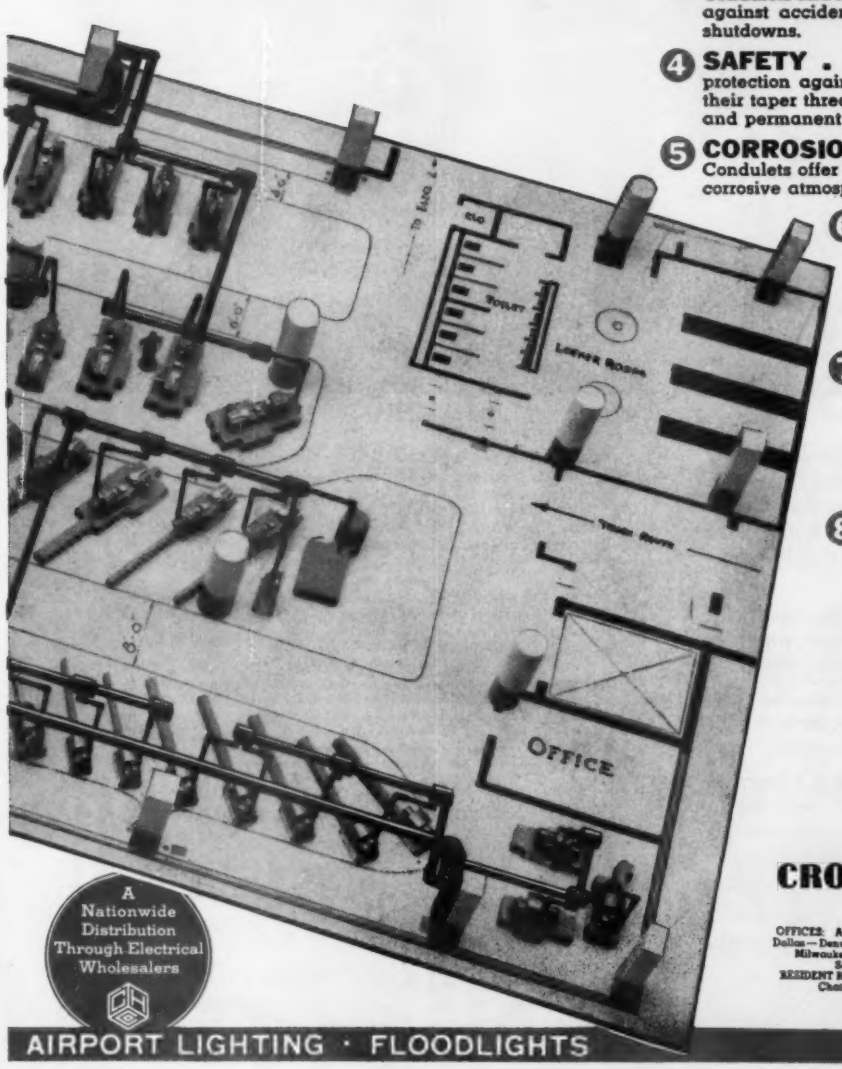


Enlarged view, showing how Type RSM Condulets provide for easy expansion . . . branch circuits can be added at any time. Simply replace a blank plate with a plate that has the required number and size of hubs.

CONDULETS · TRAFFIC SIGNALS

conduit method gives YOU definite advantages!

The photograph below shows a model of an actual installation in a screw machine department. It is an outstanding example of a layout that meets modern industry's need for flexibility, while retaining the enduring protection and safety that can only be given by cast Condulets and rigid conduit.



1 FLEXIBILITY . . . A modern Condulet installation, like the one illustrated below, provides for the vigorous growth and changing conditions of a modern industry. The RS Series Condulets with their detachable hub plates make it easy to change circuits or add additional circuits at any time.

2 UNIVERSAL APPLICATION . . . Galvanized Condulets and galvanized rigid conduit may be used under all atmospheric conditions and occupancies.

3 MECHANICAL PROTECTION . . . Cast Feraloy Condulets and rigid conduit provide the best possible protection against accidental damage to the wiring — prevents costly shutdowns.

4 SAFETY . . . A Condulet installation gives maximum protection against personal injury and fires. Condulets with their taper threaded hubs and rigid conduit provide a reliable and permanent low resistance path to ground.

5 CORROSION RESISTING . . . Cast Feraloy Condulets offer the best protection wherever moisture, dust or corrosive atmospheres are present.

6 ECONOMY . . . Direct comparison of Condulet and rigid circuit installations with other wiring methods show comparable installed costs. The durability, safety, and low maintenance cost of Condulet installations produces savings which pay dividends over the years.

7 QUALITY . . . All Condulets are built to Crouse-Hinds' high standard of quality with painstaking care by skilled craftsmen. Thousands of Condulet installations that are still in active service after twenty, thirty, forty or more years offer positive proof that the trademark CONDULET stands for reliability and long life.

8 VARIETY . . . Thousands of types and sizes of Condulets, plugs and receptacles, and lighting fixtures are listed in the Condulet Catalog, including a complete explosion-proof and dust-tight line for use in hazardous locations. There is a Condulet for every purpose.

On your next electrical layout, whether modernization or new construction, plan to get all of the benefits of sturdy cast Feraloy Condulets and rigid conduit.

*CONDULET is a coined word registered in the U. S. Patent Office. It designates a product made only by the Crouse-Hinds Company.

CROUSE-HINDS COMPANY
Syracuse 1, N. Y.

OFFICES: Amarillo — Birmingham — Boston — Buffalo — Chicago — Cincinnati — Cleveland Dallas — Denver — Detroit — Houston — Indianapolis — Kansas City — Los Angeles — Memphis Milwaukee — New Orleans — New York — Philadelphia — Pittsburgh — Portland, Ore. San Francisco — Seattle — St. Louis — St. Paul — Tulsa — Washington.
RESIDENT REPRESENTATIVES: Albany — Atlanta — Baltimore — Baton Rouge — Charlotte Chattanooga — Corpus Christi — Reading, Pa. — Richmond, Va. — Shreveport
Crouse-Hinds Company of Canada, Ltd., Toronto, Ont.

A Nationwide Distribution Through Electrical Wholesalers

AIRPORT LIGHTING · FLOODLIGHTS

Treasury Department

Typical Private Office

Easy on the Eyes

...with Lighting by LITECONTROL

Where illumination's concerned sales-minded electric utilities want the best. This one in Kentucky uses two types of standard LITECONTROL fixtures for efficient control of light . . . and smart appearance. Rolled-edge trim helps *hide* uneven spots in ceilings that flat trims only emphasize.

In the executive office, LITECONTROL No. 5134 with Holophane No. 9016 low brightness lens provides ample illumination—free from glare and sharp contrasts.

Easy to maintain. Lenses help keep dirt out. To clean —simply *push trigger-catch,* open door, wipe surfaces with damp rag, and *push door shut* — no tools required.

At left, LITECONTROL fixture No. 5838 is a practical selection for the general office. Rugged, all-metal design provides 35 to 25 degree cutoff from egg-crate louvers . . . holds glare down at critical viewing angles. No tools needed for servicing.

Two more examples of the "More Light and Looks for Your Money" you get with *every* LITECONTROL Fixture.

INSTALLATION: Kentucky Utilities Company, Lexington, Kentucky.
ARCHITECT: Robert W. McMeekin, Lexington, Kentucky.
LIGHTING ENGINEERS: R. W. Wilson, J. T. Cole & K. R. Cardey, Kentucky Utilities Company.
DISTRIBUTOR: Graybar Electric Company, Inc., Indianapolis, Indiana.
ELECTRICAL CONTRACTOR: Hatfield Electric Company, Indianapolis, Indiana.

Treasury Department

FIXTURES: 18 No. 5838, 3-lamp recessed louvered fixtures on 9′ centers — standard cool white 96T12 lamps.
INTENSITY: Room average, 90 footcandles. Desk Tops 75-80 footcandles.

Typical Private Office

FIXTURES: 8 No. 5134, 3-lamp recessed fixtures with No. 9016 lenses on 8′ centers — standard warm white 48T12 lamps.
INTENSITY: Room average, 70 footcandles. Desk Tops, 85 footcandles.

Note: Intensity figures by Kentucky Utility engineers after three months operation.

LITECONTROL
Fixtures
LITECONTROL CORPORATION
36 PLEASANT STREET, WATERTOWN 72, MASSACHUSETTS

DESIGNERS, ENGINEERS AND MANUFACTURERS OF FLUORESCENT LIGHTING EQUIPMENT DISTRIBUTED ONLY THROUGH ACCREDITED WHOLESALERS

The wiring in the average structure to-day is entirely inadequate for the load required by many new electrical appliances.

What Can Be Done About It?

Rewire with CRESCENT!

TYPE TW BUILDING WIRE

GET GREATER CURRENT CARRYING CAPACITY IN THE SAME CONDUIT

Many building owners do not realize the need for more adequate wiring of their property. The electrical contractor can offer a real service by recommending the rewiring of existing circuits with CRESCENT SYNTHOL TYPE TW BUILDING WIRE. As shown by examples to the right, this considerably increases the current-carrying capacity.

½" CONDUIT

ORIGINAL INSTALLATION (Wires already in)

3 conductors of # 12 wire with maximum current rating of

20 AMPS.

REWIRED (As permitted by N.E.C.)

Will permit installation of 3 conductors of #8 CRESCENT SYNTHOL TYPE TW WIRE, thereby doubling the maximum current carrying capacity in the same existing conduit to

40 AMPS.

¾" CONDUIT

ORIGINAL INSTALLATION (Wires already in)

3 conductors of # 10 wire with maximum current rating of

30 AMPS.

REWIRED (As permitted by N.E.C.)

Will permit installation of 3 conductors of #6 CRESCENT SYNTHOL TYPE TW WIRE, thereby increasing the maximum current carrying capacity in the same existing conduit to

55 AMPS.

It means business for YOU!

CRESCENT

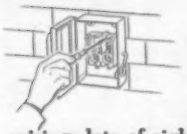
OVER 70 YEARS EXPERIENCE

WIRE & CABLE

CRESCENT INSULATED WIRE & CABLE CO.

TRENTON, NEW JERSEY

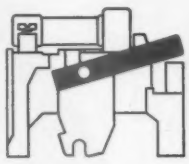
IT'S NEW... IT'S FEDERAL PACIFIC



NOW IT'S HERE... A LINE OF TYPE D SAFETY SWITCHES that has every feature you've ever wanted. Just take the 30 amp. switch as an example: (1) Big wiring gutters; solderless connectors; neutrals located for direct feed-through wiring; lots of right-size knockouts in the right places... *assurance of installation ease.* (2) Large, rugged current-carrying parts; new, patented high pressure fuse holder for cartridge-type fusing; dual knifeblade construction... *assurance of top reliability.* (3) Visible moving parts; switch blocks of high-shock phenolic material; operating bar beneath the block for fuse accessibility... *assurance of simple maintenance.*

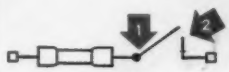
New Type D line includes 30, 60, 100, 200, 400 and 600 amp. ratings. Styling of the entire line is smart and modern... general design is uniform, bringing identical high quality, performance and good looks to every installation.

PLUS VALUES OF THE NEW 30 AMP. TYPE D



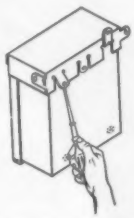
VISIBLE KNIFEBLADES

Shows at a glance if switch is "On" or "Off". Dual knife-blade construction assures trouble-free operation and long switch life.



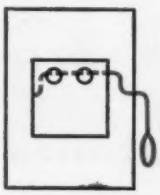
MINIMUM NUMBER OF JOINTS

Wrap around lug and bus construction minimizes number of heat-creating joints; assures cool operation.



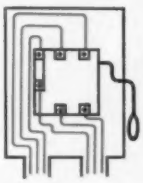
RAINTIGHT ENCLOSURES

Easiest-to-mount on irregular surfaces and poles. If back mounting ears are used pry them up with screw driver and bend down side ears.



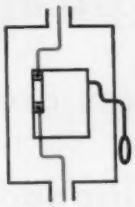
FUSES ACCESSIBLE

Operating crossbar **under** the switch block provides full access to fuses.



AMPLE GUTTER SPACE

Wide, unobstructed gutter space eliminates need for threading wire under operating crossbar.

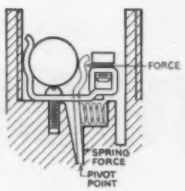


FEED-THROUGH NEUTRAL

Whether coming in at top or bottom, feed-through neutral is always readily accessible for easy wiring.

SOLDERLESS LUGS

Straight feed-in solderless lug on both line and load sides saves wire and wiring time. No wire looping; no fumbling with binding screws.



HIGH PRESSURE FUSE HOLDER

Coil spring type located in block beneath the fuse and unaffected by its heat. Holds fuse in a vise-like grip.

Write for your free copy of booklet giving the whole story on the new Federal Noark® feature-packed Type D Safety Switch line . . . the one line that gives you everything!

FEDERAL PACIFIC ELECTRIC CO.

Formerly—Federal Electric Products Company and Pacific Electric Manufacturing Corp.
Main Office: 50 PARIS STREET, NEWARK 1, N. J.

Federal Pacific products: Stab-lok Circuit Breakers, Motor Controls, Safety Switches, Service Equipment, Industrial Circuit Breakers, Panelboards, Switchboards, Control Centers, Bus Duct, High voltage circuit breakers and power switches
★ Sales offices in principal cities.

"UP IN THE AIR"

on plant expansion

when existing

circuits are

loaded

ROCKBESTOS AVC®

(N.E.C. TYPE AVA)

WIRE AND CABLE is your solution

How to get added electrical capacity to take care of needed additional plant facilities has many a production man "up in the air".

A good solution for increasing your current capacity 30 to 50% is to replace your present wire and cable with Rockbestos A.V.C.

Why not have a Rockbestos Wire Specialist give you the complete story? Phone or write the nearest branch office, today.

STOCKED COAST TO COAST

Standard Rockbestos A.V.C. (N.E.C. types AVA, AVB, etc.) are available from stock for immediate shipment. Call or write nearest branch office.

ROCKBESTOS PRODUCTS CORP.

NEW HAVEN 4, CONNECTICUT

NEW YORK • CLEVELAND • DETROIT • CHICAGO
PITTSBURGH • ST. LOUIS • LOS ANGELES • NEW ORLEANS
OAKLAND, CALIFORNIA • SEATTLE

For 50 Years....

THE WORLD'S MOST POPULAR SAFETY SWITCHES

COMPARE...LINE FOR LINE AND FEATURE FOR FEATURE

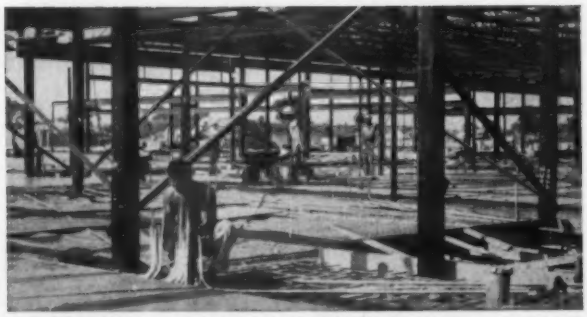
THEY COST NO MORE... WHY SETTLE FOR LESS?

ASK YOUR ELECTRICAL DISTRIBUTOR FOR SQUARE D PRODUCTS

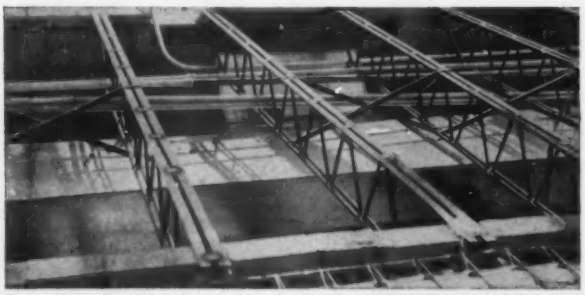
SQUARE D COMPANY

"We had good experience with Republic 'Inch-Marked' E. M. T. on other jobs!

That's why we used it here."



Contractors liked the way Republic "Inch-Marked®" E.M.T. went in on this concrete pour job. They like the savings, too. Runs are easily located and bends accurately aligned before the pour. Special concrete boxes aren't necessary. The tube is easily attached to connectors installed on boxes before spotting on the form.



Symmetrical bends are easy to make, right on the deck, using the Republic Bender. Matching the "Inch-Marks" on the tube to the calibrations on the Republic Bender, journeymen can make smooth, accurate bends, even when runs are nested closely, as shown here. Republic E.M.T. is approved by the National Electrical Code for concealed, exposed and concrete installations. It also meets standards of Underwriters' Laboratories and carries their inspection seal.

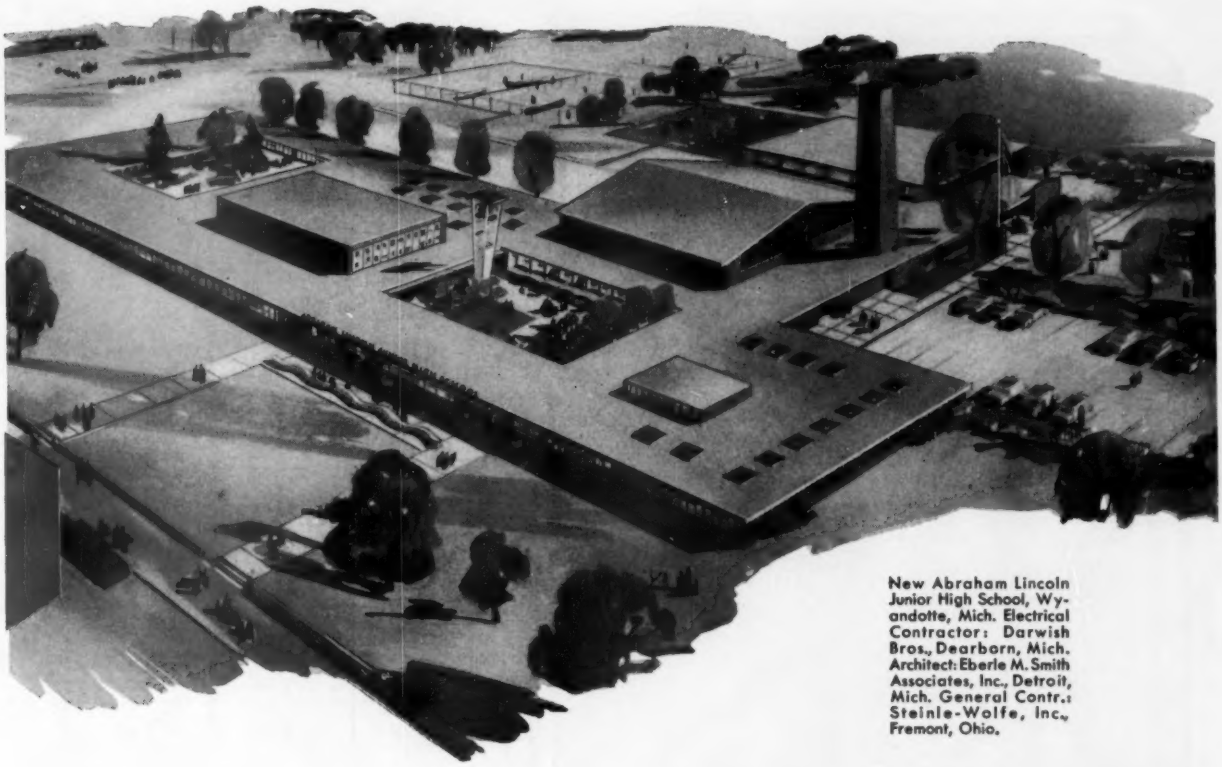
That's what Darwish Brothers, Dearborn, Michigan, electrical contractors, said about the Abraham Lincoln Junior High School job in Wyandotte, Michigan.

They found they could save a lot by using Republic E.M.T. Waste was reduced because electricians used the "Inch-Marks" to cut to length.

Smooth, accurate bends were easy to make, by matching the "Inch-Marks" on the tubing with the built-in marks

REPUBLIC

World's Widest Range of Standard



New Abraham Lincoln Junior High School, Wyandotte, Mich. Electrical Contractor: Darwish Bros., Dearborn, Mich. Architect: Eberle M. Smith Associates, Inc., Detroit, Mich. General Contr.: Steinle-Wolfe, Inc., Fremont, Ohio.

on the Republic Calibrated Bender. And the ductile steel of Republic E.M.T. makes it easy to fabricate the tubing to fit the location.

Wire-pulling and "fishing" were easier, too, because of Republic's exclusive *inside-knurling.*

It all adds up to this: a good job with less waste and savings, all down the line. Next time you order E.M.T., ask your distributor for Republic "Inch-Marked®". And be sure you get it.

STEEL

Steels and Steel Products

Connectors and couplings slip over Republic "Inch-Marked" E.M.T. Then it's easy to make tight joints without turning the whole run. There are no threads to cut, no lines to turn. This lightweight steel electrical raceway is easier to fabricate on the job as shown here—one of many ways contractors save with ELECTRUNITE.

REPUBLIC STEEL CORPORATION
3146 East 45th Street,
Cleveland 27, Ohio

REPUBLIC STEEL

Please send me more information on ELECTRUNITE® E.M.T.

Name_____

Company_____

Address_____

City_____ Zone____ State_____

K-7712

New RLM Specifications for:

1. ALL-WHITE PORCELAIN ENAMEL REFLECTORS (Inside and Outside)
2. INCREASED UPWARD LIGHT
3. MAXIMUM BRIGHTNESS
4. BETTER SHIELDING ANGLES
5. HIGHER REFLECTION FACTORS*
6. HIGHER LIGHT OUTPUT°
7. CAPTIVE LATCHING and HOLDING DEVICE
8. GROUNDED BALLAST MOUNTING
9. CHANNEL DESIGNED for SLIDING HANGERS
10. REVISED LAMP SPACING
11. IMPROVED LAMPHOLDERS
12. ENTIRE UNIT RUST-PROOFED

RLM STANDARDS INSTITUTE

24 FLUORESCENT UNITS

	DIRECT	SEMI-DIRECT	TOTALLY DIRECT
1	Yes	Yes	Optional
2	5%-15%	20%-30%	None
3	Yes	Yes	
4	13°-14°	27°	13°-14°
5	85%	85%	85%
6	83%	77%	80%
7	Yes	Yes	Yes
8	Yes	Yes	Yes
9	Yes	Yes	Yes
10	5"		5"
11	Yes	Yes	Yes
12	Yes	Yes	Yes

22 INCANDESCENT UNITS

*—85%

°—new range from 63% to 80%

NEW RLM SPECIFICATIONS

a new contribution to illuminating engineering progress with 12 ADVANCEMENTS IN INDUSTRIAL LIGHTING!

Both fluorescent and incandescent RLM Specifications for 1955 include important improvements. In step with illuminating engineering progress, RLM Standards take recognition of industry's ever-increasing demand for more light, both on working surfaces and ceilings; better shielding; increased efficiency; easier and lower-cost maintenance.

In addition to the 12 advancements listed here, there are many other important revisions in the new RLM Specifications. These changes bring advantages that make specifying units bearing the RLM Label more important than ever!

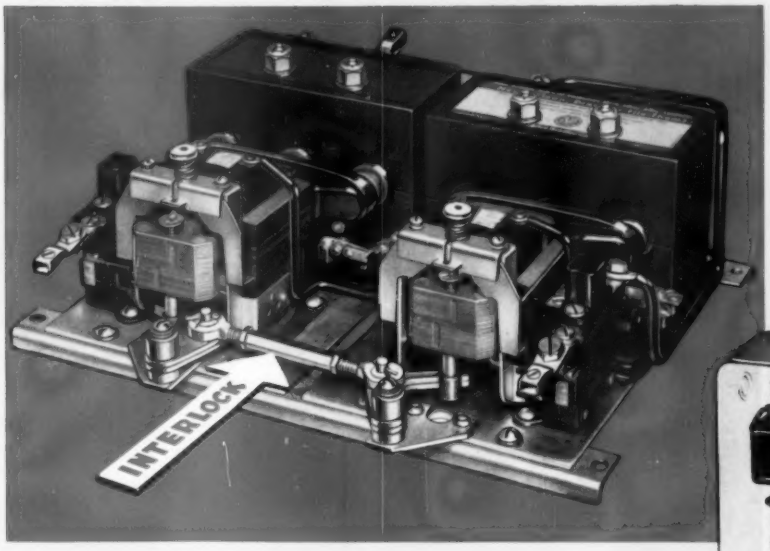
A complete compilation of all new RLM Specifications covering 46 different types and sizes of incandescent and fluorescent industrial lighting units, may be found in the new 1955 RLM Specifications Book.

Included are the names and addresses of RLM participating manufacturers who make one or more lighting units bearing the RLM Label. For your complimentary copy, sent without obligation, please address your request on your company letterhead to:

RLM Standards Institute, Suite 819
326 W. Madison St., Chicago 6, Ill.

B245

BULLETIN 705 REVERSING ACROSS-THE-LINE STARTERS



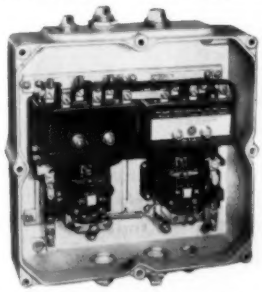
Allen-Bradley reversing starters have two solenoid contactors—FORWARD and REVERSE—which are mechanically, as well as electrically, interlocked to provide maximum safety for motor and machine.

The complete line of A-B solenoid reversing starters includes 8 sizes and 5 NEMA type enclosures.

TROUBLE FREE REVERSING STARTERS

..... up to 300 HP, 220 V; 600 HP, 440-550V.

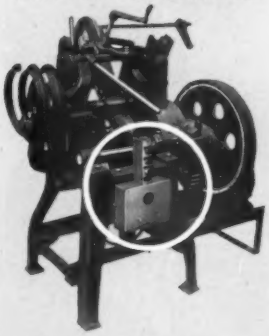
For squirrel-cage or slip-ring motors that must be reversed in their operation, the most dependable control is the Bulletin 705 reversing starter. The two Allen-Bradley solenoid switches ... with their double break, silver alloy contacts ... are maintenance free. Their rugged construction makes them especially suitable for plugging operations. The contacts will not weld or flash over, and they require no cleaning, filing, or dressing.



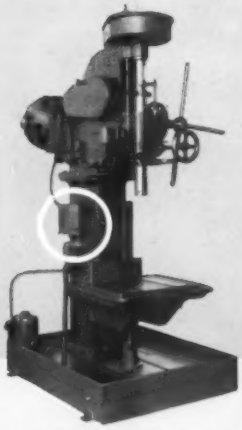
Bulletin 705 reversing starter in NEMA Type 4 waterproof enclosure.

Bulletin 706 combination reversing starters are equipped with manual disconnect switches, with or without fuses. Bulletin 707 combination reversing starters have circuit breakers. Allen-Bradley reversing starters are available with or without overload relays. Listed as standard in enclosures for general purpose, watertight, weatherproof, and hazardous dust and fume locations. Write for A-B Handy Catalog, today.

TYPICAL APPLICATIONS



Excelsior Circular Bending Machine with A-B reversing starter and 3-button control.



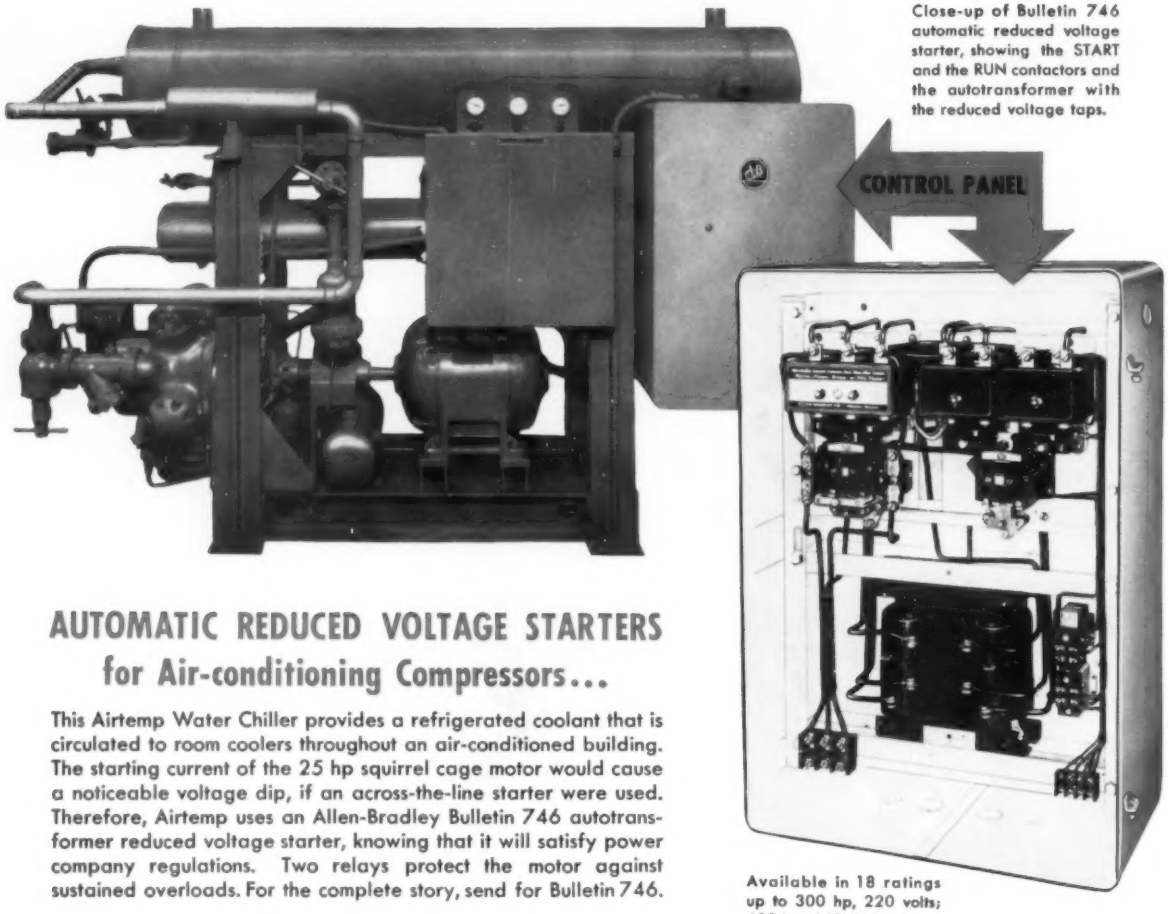
Baker Heavy Duty Drilling Machine with A-B reversing starter in NEMA 1 enclosure.

Allen-Bradley Co., 1316 S. Second St., Milwaukee 4, Wis.
In Canada—Allen-Bradley Canada Limited—Galt, Ont.

3-55-M

A-B Quality

ALLEN-BRADLEY
BULLETIN 705 REVERSING SWITCHES
QUALITY



Close-up of Bulletin 746 automatic reduced voltage starter, showing the START and the RUN contactors and the autotransformer with the reduced voltage taps.

Available in 18 ratings up to 300 hp, 220 volts; 600 hp, 440-550 volts.

AUTOMATIC REDUCED VOLTAGE STARTERS for Air-conditioning Compressors...

This Airtemp Water Chiller provides a refrigerated coolant that is circulated to room coolers throughout an air-conditioned building. The starting current of the 25 hp squirrel cage motor would cause a noticeable voltage dip, if an across-the-line starter were used. Therefore, Airtemp uses an Allen-Bradley Bulletin 746 autotransformer reduced voltage starter, knowing that it will satisfy power company regulations. Two relays protect the motor against sustained overloads. For the complete story, send for Bulletin 746.

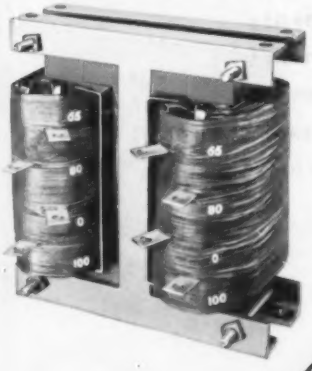
QUALITY COMPONENTS OF ALLEN-BRADLEY BULLETIN 746 AUTOMATIC AUTOTRANSFORMER STARTERS

SOLENOID STARTER

The basic unit of the Bulletin 746 reduced voltage starter is the Bulletin 709 solenoid switch with double break, silver alloy contacts that are maintenance free. They are good for millions of trouble free "starts."

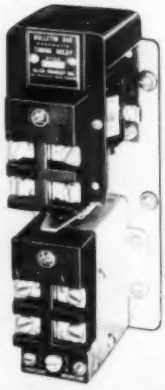
Right — Autotransformer with 50, 65, and 80% taps.

TAPPED AUTOTRANSFORMER



Right — Bulletin 849 pneumatic adjustable timer which controls the time interval between closing of the "start" contactor and closing of the "run" contactor. It automatically disconnects the autotransformer and closes the running contactor for full voltage on the squirrel-cage motor.

TIMING RELAY



3-55-M

Allen-Bradley Co., 1316 S. Second St.
Milwaukee 4, Wis.
In Canada—Allen-Bradley Canada Limited
Galt, Ont.

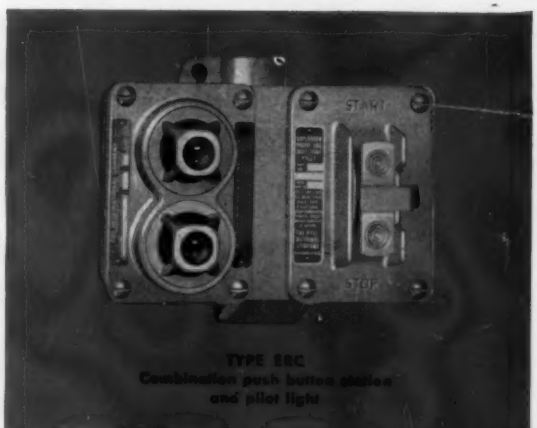
A-B Quality

ALLEN-BRADLEY QUALITY

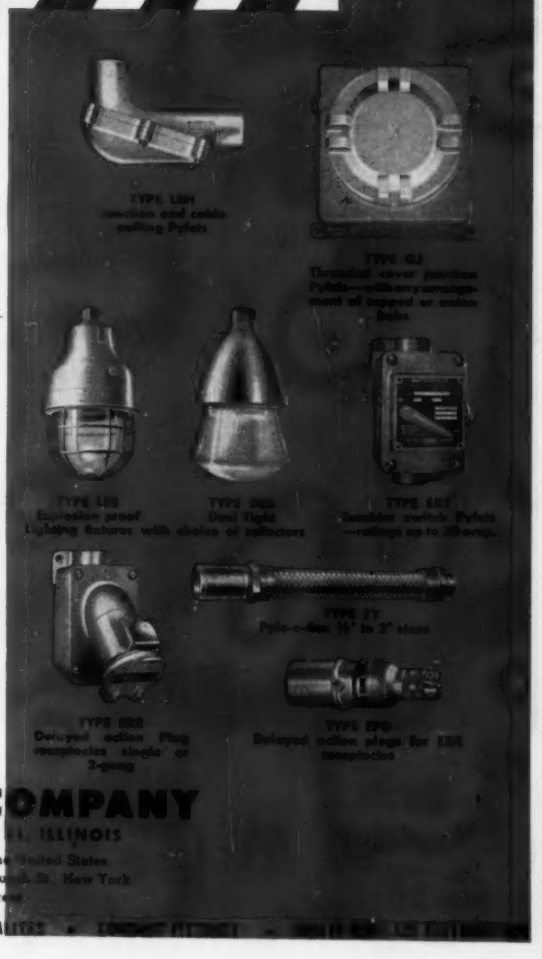
EXPLOSION-PROOF and DUST-TIGHT

PYLETS®

FOR HAZARDOUS LOCATIONS



TYPE ERC
Combination push button station and pilot light



TYPE LBH
Junction and cable pulling Pylets

TYPE GJ
Threaded cover junction Pylets—with any arrangement of tapped or entry holes

TYPE LBS
Explosion proof Lighting fixtures with choice of reflectors

TYPE DBS
Dust Tight

TYPE ERS
Explosion switch Pylets—ratings up to 30 amps.

TYPE EY
Pylo-cables ½" to 2" sizes

TYPE ERR
Delayed action Plug receptacles single or 2-gang

TYPE EPD
Delayed action plugs for ERR receptacles

For added safety in hazardous locations specify from this rapidly expanding quality line of explosion-proof and dust-tight Pylets which the Pyle-National Company is constantly developing to meet the growing needs of industry.

All explosion-proof and dust-tight Pylets are designed in accordance with Underwriters' Laboratories requirements for electrical devices used in hazardous locations as defined in Article 500 of the National Electrical Code.

The substantial construction and high quality of materials and workmanship insures added safety, uninterrupted service and long life.

Write for literature and names of authorized distributors in your area.

SINCE 1897

THE PYLE-NATIONAL COMPANY

1344 NORTH KOSTNER AVENUE, CHICAGO 51, ILLINOIS

District Offices and Representatives in Principal Cities of the United States
Export Department: International Railways Supply Co., 30 Church St., New York
Canadian Agent: The Holden Co., Ltd., Montreal

PLUGS AND RECEPTACLES • FLOODLIGHTS • TURBO-GENERATORS • GYRALITES • [illegible]

the grounded portable lighting

for modern plants

McGill 5000 series grounded service lights feature the convenience outlet and plug adopted as standard by Underwriters' and the National Electrical Code. Blade arrangement includes parallel blades and U shaped third blade for ground. This heavy duty portable and any attached power tools are completely grounded. Molded phenolic handle is heat and impact resistant and positively insulated. Heavy wire cage featuring end lens is zinc plated with chromate finish. Available with or without black rubber 16-3-SJ cord and Levolier Switch.

McGILL 5025-5LRG

McGILL® *lamp guards*

STAND THE WEAR AND ABUSE OF HEAVY USE

The most popular all purpose portable lamp guard ever produced, the McGill 7000 series, has extra heavy steel wires electrically welded with a chromate finish over a heavy zinc plate. Pliable molded rubber handles provide cord seal and strain relief disk. Lampholders are 660 watt 250 volt either plain or waterproof. No-Rol feature. Available with or without Levolier switch and 18-2-SJT black rubber cord. Will last many times longer than ordinary portable in all heavy duty industrial applications.

McGILL 7000-5R

all are McGILL *quality*

water-tight vapor-tight and moisture proof

portable lighting

These 3000 series McGill Vaporproof portables are used extensively in flour mills, elevators, ships, food processing plants and warehouses to eliminate hazards of shock, glass splinters and sparks from broken bulbs. A heat and impact resistant globe seals against the molded phenolic handle to guard the bulb from splashing liquids. The best in protective portable lighting available in 60 or 100 watt bulb size with either metal or fibre cages.

McGILL 3006

NEW portable

for spot or flood lamps

Designed in two sizes for 75 or 150 watt spot or flood lamps this new series offers an especially durable portable that throws light into ordinarily inaccessable places. Cages available for both PAR-38 or R-30-75 lamps on a pliable rubber handle, are standard with or without Levolier switch. The newest thing in dependable portable lighting. Underwriters' approved as are all McGill Portable Lamp Guards.

McGILL 7000-30

50th McGILL Anniversary

YOU CAN DEPEND ON

McGILL QUALITY

Available through leading Electrical Wholesalers

For complete information on products of the McGill Electrical Division, write today for Catalog No. 49-A.

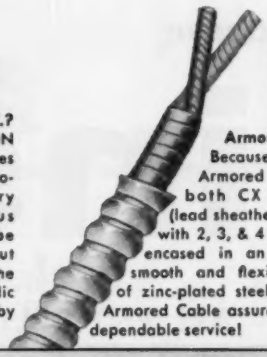
McGILL MANUFACTURING COMPANY, INC.
450 N. Campbell St., Valparaiso, Indiana

Why

CLIFTON Rigid Conduit? Because only CLIFTON Conduit has the extra protection of a heavy zinc coating on both the inside and the outside . . . applied by Clifton's special hot-dip method!

Why

CLIFTON E.M.T.? Because CLIFTON hot-dip E.M.T. gives *double* the zinc protection of ordinary E.M.T.! This famous CLIFTON tubing can be bent and angled without chipping and flaking. It is the most durable electrical metallic tubing made and is distinctive by its brightness!



Why

CLIFTON Armored Cable? Because CLIFTON Armored Cable in both CX and CXL (lead sheathed) is made with 2, 3, & 4 conductors encased in an extremely smooth and flexible armor of zinc-plated steel. CLIFTON Armored Cable assures years of dependable service!

Power and Light Lines are the Lifelines Everywhere . . . . and CLIFTON CONDUIT Carries the Load Best!

Why

CLIFTON Un-Armored Service Entrance Cable? Because CLIFTON 2 & 3-Conductor Service Entrance Cable is manufactured under the most stringent conditions to make it absolutely impervious to moisture! Special rubber coated "Mylar" tape—is used in all CLIFTON Service Entrance Cable!

Why

CLIFTON Non-Metallic Sheathed Cable? ("CLIFTX") Because "CLIFTX" is protected against moisture and rot. With a tightly braided fibreglas covering, saturated with an asphalt compound, CLIFTON cable is silver finished and further protected with a thin coating of high-melting point wax.

Why

CLIFTON Flexible Steel Conduit? Because Clifton Flexible Cable is made in such a manner as to always have a more uniformly smoother surface. This makes for easier handling and pulling!

WRITE TODAY For Full Information

Warehouses Throughout the Country.

REPRESENTATIVES IN PRINCIPAL CITIES

Clifton

CONDUIT COMPANY, INC.

MAIN OFFICE
75 Montgomery St.
Jersey City 2, N. J.

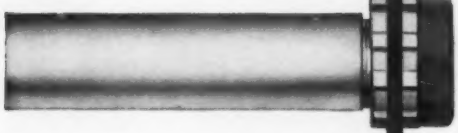
FACTORIES
MEMPHIS
Tennessee
BALTIMORE
Maryland

WIRE—CABLE—RIGID CONDUIT—ELECTRIC METALLIC TUBING—CLIFTALL UF

Introducing

insuline

AN ENTIRELY NEW CONCEPT IN FITTINGS FOR . . .

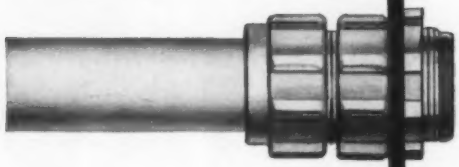


STANDARD RIGID CONDUIT

Insulating Bushing

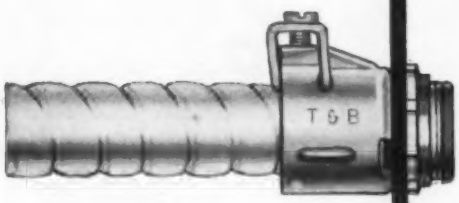
Insulated Metallic Bushing*

Insulated Chase Nipple*



ELECTRICAL METALLIC TUBING

Insulated EMT Connectors



FLEXIBLE CONDUIT OR ARMORED CABLE

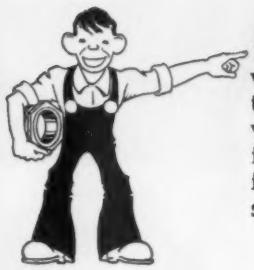
Insulated Tite-Bite Connector — straight

Insulated Tite-Bite Connector — 90°

Patents Applied For

*available soon

ABSOLUTELY THE FIRST LINE OF SELF-INSULATED RACEWAY FITTINGS . . . ANOTHER NEW T & B ENGINEERED EXCLUSIVE . . . DESIGNED FOR LOWEST INSTALLED COST . . . BRIGHT BLUE FOR EASY INSPECTION



insuline fittings — exclusive with T & B — permit a new high in electrical wiring practices, new ease of wiring installation and inspection. Here, for the first time, is a line of raceway fittings each with its own integral insulating unit!

insuline fittings — for Standard Rigid Conduit, E.M.T., and Flexible Conduit offer absolute wire protection. Tough T & B "insulining" provides a slick passage for easy wire pulling without wire skinning abrasion . . . for use wherever the Code requires protection for cable sheath or wire insulation against damage from metal surfaces. (1953 NEC, Para. 3736b — Insulation at Bushings.)

insuline fittings — for easy inspection — offer visual evidence that the connection is insulated. Brilliant blue T & B "insulining" protrudes slightly beyond the fitting body forming a telltale ring that an inspector can see at a distance.

For free samples and technical data, contact your nearby T & B Distributor or write to the address below.

LOOK FOR THIS SIGN — AUTHORIZED DISTRIBUTOR T&B ENGINEERED

IT'S THE MARK OF AN AUTHORIZED **T&B** DISTRIBUTOR

The complete line of T & B fittings for conductors and raceways is sold only by recognized electrical wholesalers. It's our way of assuring you the service and savings of a friendly local source. Call him for all your electrical needs. T54

All T & B INSULINE fittings bear Underwriters' Laboratories approval.

THE THOMAS & BETTS CO.

INCORPORATED

Butler Street • Elizabeth 1, New Jersey

Thomas & Betts Ltd., Montreal, P.Q., Canada

MANUFACTURERS OF QUALITY ELECTRICAL FITTINGS SINCE 1898

all new!

No. 9755
New Cord Grip New "Fiberite Face"

No. 5294
New Cord Grip New "Fiberite Face"

No. 5694
New Cord Grip New "Fiberite Face"

3 New Bryant Cord Connector Bodies Take Full Range of Wire Sizes (.296 to .625 in.)

For use in industrial plants, steel mills, shipyards, garages — wherever there's rugged usage.

These all-new Bryant molded rubber cord connector bodies for the first time permit using the wide range of wire sizes needed in heavy-duty installations. Built to "take it", this new line should be used with the companion caps shown at right.

Listed by Underwriters' Laboratories, Inc.

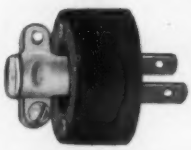
Specify Bryant from your Electrical Distributor

THE BRYANT ELECTRIC COMPANY
Bridgeport 2, Connecticut
Chicago • Los Angeles

BRYANT
SUPERIOR WIRING DEVICES

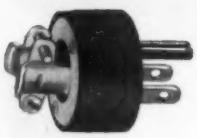
J-99928

Use New Cord Connector Bodies With These Bryant Caps



CONNECTOR No. 9755

fits Caps	Cord Grip
No. 9754	.296 to .562
No. 9756	.406 to .625

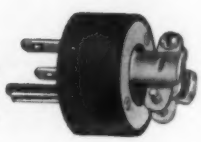


CONNECTOR No. 5294

fits Caps	Cord Grip
No. 5266	.296 to .562
No. 5267	.406 to .625

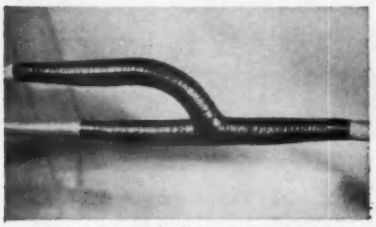
CONNECTOR No. 5694

fits Caps	Cord Grip
No. 5666	.296 to .562
No. 5667	.406 to .625



UNUSUAL BRANCH CONNECTOR Saves Manhole Wall Space

With all the remarkable synthetic fibers appearing on the market, a lot of new plants are going up to manufacture them. One of the biggest plants ordered 28,000 feet of Okolite-Okoprene cable for its underground primary distribution system.



One of the interesting features of this big installation was their method of saving manhole wall space—an important consideration in all underground work. Since the cable was about 2" in diameter, it would have required around 24" space for training the tap, if a regular Tee joint was used.

Instead Okonite engineers worked out a preformed branch connector, in cooperation with a fitting manufacturer. From the picture you can see that by forming the connector instead of bending the cable the radius of bend was cut in half. Q.E.D.: only half as much manhole wall space was required.

Engineers at this plant weren't taking any chances with their cables . . . and they weren't taking any chances with their splices either. They made all their splices with Okolite, Manson and Okoprene tape.

It's good sense and good business to use a better tape and obtain a joint that's "spliced for life." The tape represents only a small fraction of the total cost of the job.

Why not send for a set of instruction sheets, EC-5678; you'll find them helpful.

. . . when you splice with:

For Protecting Splices and Terminals on Electrical Wires & Cables
FRICTION
Manson Tape
3/4 INCH 1/2 POUND
MANUFACTURED SOLELY BY THE OKONITE COMPANY
OKOLITE TAPE

AVAILABLE THROUGH AUTHORIZED DISTRIBUTORS ONLY

1441

Made by

THE OKONITE COMPANY

PASSAIC NEW JERSEY

SINCE 1878

SPECIALISTS IN ELECTRICAL WIRES, CABLES AND SPLICING MATERIALS FOR 75 YEARS

Public area in the First Federal Savings and Loan Co., Conover, N. C. Clemmer, Horton & Rudisell, architects, Robert Bush, consulting engineer.

A COMBINATION OF *Skylike* AND *Silver-dot* FOR THE ULTIMATE IN . . .

A view behind the tellers' counters with Silver-dot units over them and Skylike units over the general work area.

The general work area behind the tellers' counters. Skylike unit recessed in a Reynolds Corrugated and Perforated Aluminum ceiling.

LIGHTING INSTALLATIONS

Three essential factors of lighting installations are PERFORMANCE, ECONOMY, EFFECTIVENESS, and this combination of Skylike and Silver-dot units provides those essentials to their highest degree.

The even distribution of Skylike units provide glareless light over the public areas for "comfortable seeing" (top illustration). The work areas (shown on the left) have Silver-dot unit over the tellers' desks for the accent and supplementary lighting required, and Skylike units over the general work area for "easy-to-work-with" lighting.

This combination is a complete installation—that proves its effectiveness by its beauty, its economy by low initial cost, lowest current consumption and easy maintenance, and its performance by the lighting comfort it provides to workers and customers.

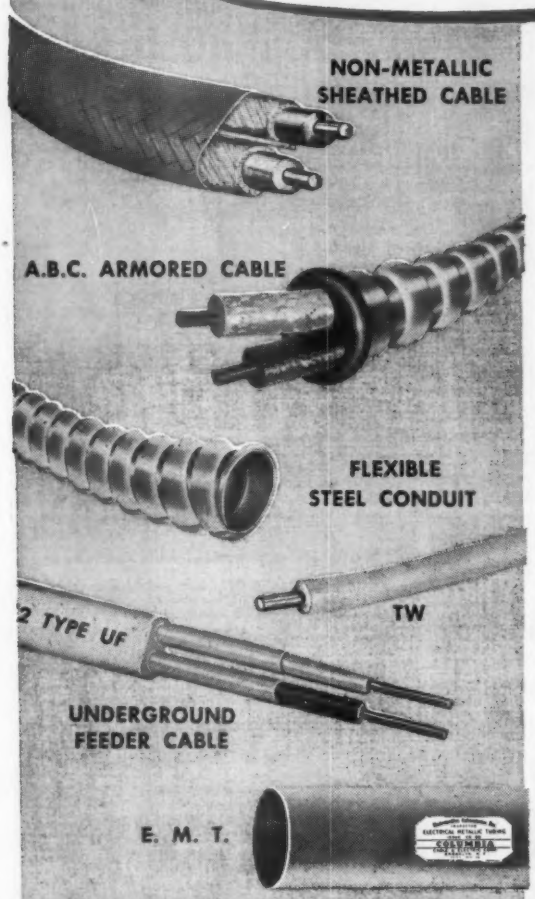
Here, indeed, is a typical example of Skylike installations in which functional light also becomes an integral part of architectural design.

OFFICE
RKO BUILDING
Radio City, N. Y.

SKYLIKE LIGHTING, INC.
A SILVRAY ASSOCIATED COMPANY

FACTORY
BOUND BROOK
New Jersey

and make sure it's Columbia



This electrician is specifying Columbia Cable, Wire, and Conduit. And for good reason.

From experience, he knows that Columbia products are easily installed . . . easy to work with. Take your cue from the man on the job . . . he knows . . . make your next installation Columbia and see!

Approved by Underwriters' Laboratories

Free
Send for Columbia Electrical Data Guide Book

COLUMBIA CABLE & ELECTRIC CORP.
Serving the Electrical Wholesaler Since 1912
255 Chestnut St. Brooklyn 8, N. Y.

Sales Representatives in Following Cities:

Atlanta, Ga.
Boston, Mass.
Charlotte, N. C.
Chicago, Ill.
Cleveland, Ohio
Coral Gables, Fla.
Cincinnati, Ohio
Dallas, Tex.
Detroit, Mich.
Glassport, Pa.
Houston, Tex.
Kansas City, Mo.
Los Angeles, Calif.
Minneapolis, Minn.
New Orleans, La.
New York, N. Y.
Philadelphia, Pa.
Portland, Ore.
St. Louis, Mo.
San Francisco, Calif.
Seattle, Wash.
Utica, N. Y.
Tulsa, Okla.

If you sell, specify, or install electrical wiring devices : make it

P&S

Designed for Easy Wiring . . . for Hard Usage Year after Year

P & S KEYLESS LAMPHOLDERS

Practically every wiring installation calls for one or more of these lampholders. Strictly utilitarian, yes — but made of fine P&S porcelain with a quality P&S interior, they will give years of trouble-free service.

For 3¼" box — P&S 41.

For 3¼" and 4" boxes — P&S 110.

P&S 110

P & S PULL LAMPHOLDERS

P&S 4046-2

Feature one-piece construction — no separate shadeholder ring to loosen and fall off. Built-in mechanism of simplified design with terminal screws in most get-at-able position, eliminates necessity of removing interior to wire.

For 3¼" box — P&S 4026 with insulated chain, P&S 4026-2 with short chain and cord.
For 3¼" and 4" boxes — P&S 4046 with insulated chain, P&S 4046-2 with short chain and cord.

P & S PULL LAMPHOLDERS with CONVENIENCE OUTLETS

Have same one-piece construction as the P&S 4026 Line, PLUS a convenience outlet connected internally — no extra wires, soldering or taping. Ideal for attic, basement, garage, etc., where inexpensive lampholder with outlet is desirable.

For 3¼" box — P&S 5026 with insulated chain, P&S 5026-2 with short chain and cord.
For 4" box — P&S 5046 with insulated chain, P&S 5046-2 with short chain and cord.

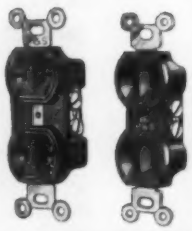
P&S 5046-2

P & S 1530 and 1570 — The OUTLETS with COMPLETELY INSULATED BACKS

Both P&S 1530 and P&S 1570 are easy to wire. Large head binding screws are spaced far apart — bodies are shorter, leaving more room in box. Plate screw hole in strap — no rivet to twist or turn. Both outlets have long-life phosphor bronze contacts — washer type ears — easy find slots.

P&S 1530 (brown) and P&S 1530-I (ivory) — T slot type.

P&S 1570 (brown) and P&S 1570-I (ivory) — Parallel slot type, double grip contacts.



P&S 1530 P&S 1570

Illustrated are just a few of the hundreds of wiring devices in the complete P&S line. All lampholders shown conform to Fed. Spec. W-L-142. Outlets conform to Fed. Spec. W-R-151. Every P&S device is a quality device — the result of experienced engineering, precision manufacturing and rigid inspection. Every P&S wiring device is BUILT TO LAST.

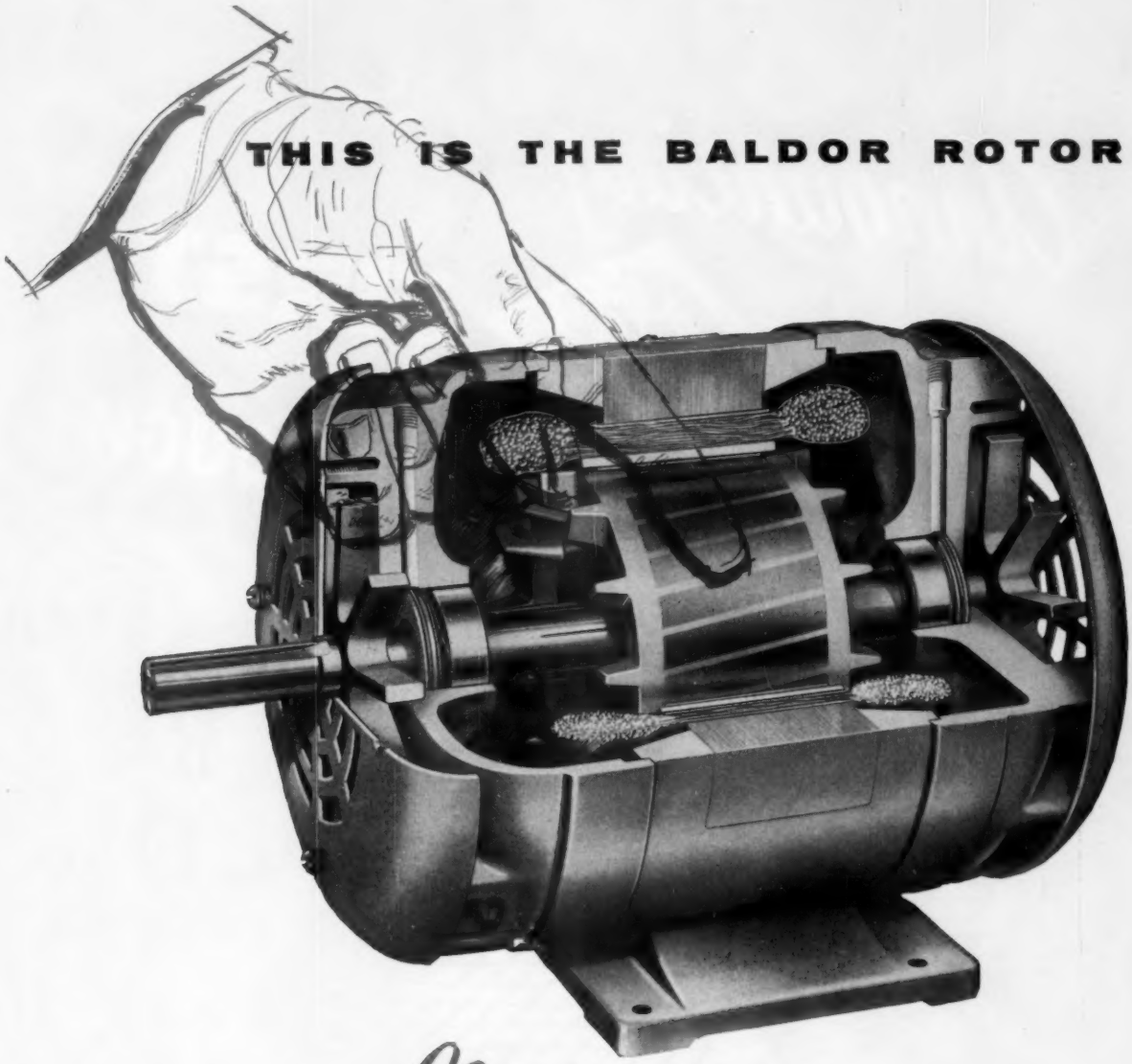
YOU CAN'T AFFORD LESS THAN THE BEST

Write Now for Catalog
Address Dept. M

PASS & SEYMOUR, INC. SYRACUSE, N. Y.

OFFICES: 71 Murray St., New York 7, N. Y. • 1229 W. Washington Blvd., Chicago 7, Ill.
In Canada: Renfrew Electric & Refrigerator Co., Ltd., Renfrew, Ont.

THIS IS THE BALDOR ROTOR



CONTAINED IN THE *New* BALTRIC LINE

The rotor is the very heart of any electric motor, and the Baltric Motor contains the heart of a champion. Advanced engineering and improved techniques mark the entire Baltric line of completely enclosed motors which have achieved a rotor with less noise . . . better balance.

The new Baltric Motor is designed and built to attain the utmost in stamina and performance with less bulk and less weight. Baltric Motors can be engineered to meet your special mechanical and electrical requirements. Remember . . . they are totally enclosed, *Streamcooled* . . . your Best Buy is Baltric!

BESS-2

Original *Streamcooled* Baldor Motors Available — Built to Former NEMA Standards

BALDOR ELECTRIC COMPANY

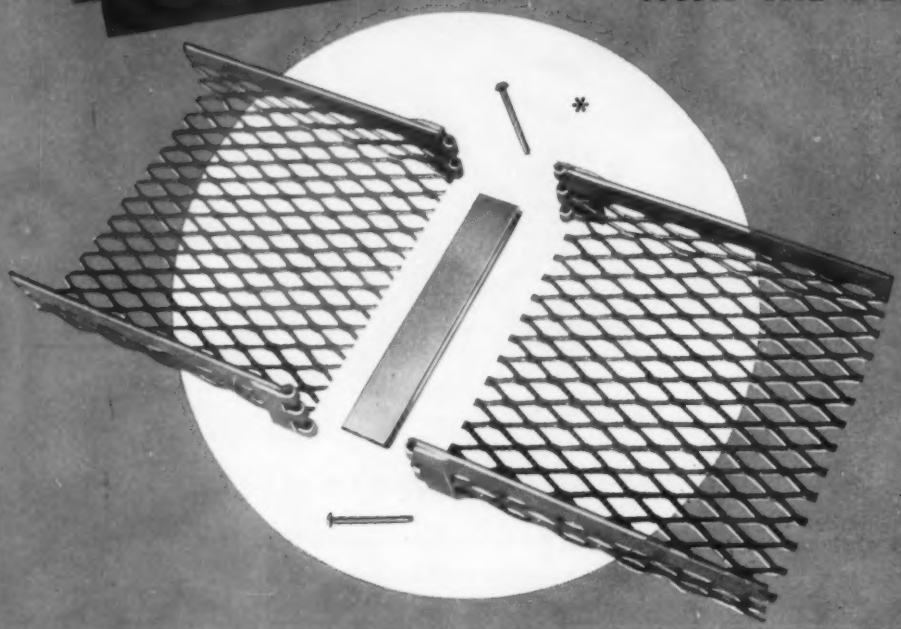
Baltric Motors Are Available in Polyphase • Squirrel Cage • Induction and Single Phase • Capacitor Start • Induction Run Types

4353 DUNCAN AVENUE • ST. LOUIS 10, MISSOURI

Announcing another Cope FIRST

the new COPE CABLE TROUGH

WITH THE BUILT-IN COUPLER



up to 80% SAVINGS in erection time

The new Cope coupler is an integral part of all units. A metal "I" shaped piece is also supplied for each joint to fit between the ends of the mesh and thus eliminate sharp edges. Cope Cable Trough Systems are available in widths of 6", 9", 12", 18" and 24" and in straight lengths of 8', 10' and 12'. A wide range of fittings for each width permits the system to be rapidly assembled on the job site to conform to any plant layout.

Should field cutting of the trough be required, special bolt-on couplers are available which will join the cut-off end of the trough to the regular pin-type coupler.

Cope

T. J. COPE, INC.

711 SOUTH 50th ST., PHILADELPHIA 43, PA.

*Patent Pending

ANOTHER EXAMPLE OF Cope LEADERSHIP...

REPRESENTATIVES

AMARILLO, TEXAS
Williamson Sales Co., Box 1324

ATLANTA, GEORGIA
The Gearhart Co., P. O. Box 85, Northside Station

BALTIMORE, MARYLAND
J. D. Amelia, 208 W. Chesapeake Ave., P. O. Box 6759, Towson, Baltimore, Md.

BEAUMONT, TEXAS
Williamson Sales Co., P. O. Box 3164

BIRMINGHAM, ALABAMA
The Gearhart Company, 1727 Sixth Avenue, North

BOSTON, MASSACHUSETTS
J. J. Costello Co., 131 Clarendon Street

BUFFALO, NEW YORK
Vincent J. Brown Co., 564 Ellicott Square

BUTTE, MONTANA
Fred W. Carlson, 604 Utah Avenue

CHARLOTTE, NORTH CAROLINA
Glenn & Larson, 123 Brevard Court

CHICAGO, ILLINOIS
Hooper-Green Co., 407 S. Dearborn St.

CLEVELAND, OHIO
E. F. Burke Agency, 1900 Euclid Avenue

CORPUS CHRISTI, TEXAS
Williamson Sales Co., 922 Wilshire St.

DALLAS, TEXAS
Williamson Sales Co., Slocum at Cole St.

DEARBORN, MICHIGAN
George R. Horne Company, 22187 Michigan Avenue

DENVER, COLORADO
Hamilton Associates, 1236 Elati Street

DES MOINES, IOWA
Geo. W. Swallow, Chas. L. Ward Co., 5707 Waterbury Circle

HOUSTON, TEXAS
Williamson Sales Company, 5541 Armour Drive

HUNTINGTON, WEST VIRGINIA
Muller, Harper & Assocs., Inc. 407 Twelfth Street

INDIANAPOLIS, INDIANA
Hooper-Green Co., 6216 Carrollton Ave.

JACKSON, MISSISSIPPI
Williamson Sales Company P.O. Box 3223, West Jackson Station

KANSAS CITY, MISSOURI
Chas. L. Ward Co., 3122 Roanoke Road

LOUISVILLE, KENTUCKY
Hooper-Green Company, 319 Marion E. Taylor Bldg.

MIAMI, FLORIDA
The Gearhart Co., 416 Langford Bldg.

MINNEAPOLIS, MINNESOTA
The Klass Company, 814 So. Ninth St.

NEW HAVEN, CONNECTICUT
J. J. Costello Co., P. O. Box 88

NEW ORLEANS, LOUISIANA
Williamson Sales Company 210 Delta Bldg.

NEW YORK, NEW YORK
David M. Miller Co., Inc., 31 Nassau St.

OKLAHOMA CITY, OKLAHOMA
Harold E. Bates, Chas. L. Ward Co., 3125 N.W. Grand Blvd.

PHILADELPHIA, PENNSYLVANIA
The Bradley Co., 3341 Arch Street

PINE BLUFF, ARKANSAS
Williamson Sales Company, P.O. Box 3

PITTSBURGH, PENNSYLVANIA
Muller, Harper & Assocs., Inc., First National Bank Bldg.

PORTLAND, OREGON
Fred W. Carlson, 935 Northwest 12th St.

ST. LOUIS, MISSOURI
Edwin S. Waterman, 494 Arcade Bldg., 812 Olive Street

SAN ANTONIO, TEXAS
Williamson Sales Company, Box 1324

SAN FRANCISCO, CALIFORNIA
Geo. E. Honn Co., 420 Market Street

SAN GABRIEL, CALIFORNIA
H. J. Randolph Co., 736 Santa Anita St.

SEATTLE, WASHINGTON
Fred W. Carlson, 2307 Fifth Avenue

SHREVEPORT, LOUISIANA
Williamson Sales Company P.O. Box 1223

SYRACUSE, NEW YORK
Vincent J. Brown Co., 218 Harrison St.

CANADA

CALGARY, ALBERTA
Bunston, Ltd., 510 9th Avenue, West

DORVAL STATION, P. O. (Montreal)
Marshall Equipment Co., Inc., P. O. Box 28

VANCOUVER, B. C.
Bunston, Ltd., 2532 Yew Street

FOREIGN

MANILA, PHILIPPINE ISLANDS
Communications Electrical Equipment & Supply Co., Inc., 517 Dasmarinas, P. O. Box 58

SANTURCE, PUERTO RICO
Victor M. Garcia, 1357 Ponce de Leon Ave.

The New Cope Cable Trough has a built-in coupler . . . this is typical of the constant efforts of T. J. Cope, Inc. to bring you a stronger and more economical product.

In line with these efforts, Cope pioneered and developed the acceptance of Cope Cable Trough through original design, engineering service and high quality manufacturing standards.

Now Cope has anticipated its many customers' needs for a product which will save up to 80% in erection time and give still greater strength.

Every straight length and fitting in the versatile Cope Cable Trough system now has a built-in coupler—no more nuts, bolts and washers!

The Cope Representative in your territory will be glad to explain the new coupler and show you samples so that you can have the advantage of this latest Cope development in your next new construction program or plant modernization project.

Write today for the new Cope Bulletin which illustrates and describes the New Cope Cable Trough with the built-in coupler. Ask for Bulletin M-2.

THE "PLUS FACTOR" FOR EFFICIENT ELECTRICAL INSTALLATIONS
1
3
2
4 WAYS
TO GREATER EFFICIENCY & LOWER INSTALLATION COSTS
1 HOT GALVANIZED
2 ELECTRO GALVANIZED
3 BLACK ENAMELED
4 ELECTRICAL METALLIC TUBING
1 HOT GALVANIZED: The specially selected pipe for this conduit is first thoroughly cleaned by pickling and then immersed in a bath of molten pure zinc. After removal from this bath by a special process which leaves a clean, smooth coating of zinc on both the outside and inside of the pipe, the pipe is accurately threaded. A coating of tough transparent enamel is baked on both the outside and inside of the conduit, providing a smooth raceway through which wires may be readily fished.
2 ELECTRO GALVANIZED: The pipe after being threaded, reamed and carefully inspected is again thoroughly cleaned before galvanizing. The galvanizing equipment is so devised and arranged that the pipe is uniformly coated with zinc on the exterior from one end to the other. Tests are continually made to insure proper weight of coating. A coat of tough, smooth and elastic black enamel is then baked on the interior.
3 BLACK ENAMELED: After dipping in the enamel, the conduit is allowed to set to insure uniform thickness of the coating and to prevent wrinkling. The loaded cages of pipe are then placed in baking ovens where an even temperature is accurately maintained by pyrometers. The enamel is baked to a high lustrous finish, having a thorough tight coat with proper elasticity to guard against cracking in any bending or forming operation during installation.
4 ELECTRICAL METALLIC TUBING: The exterior is given a uniform protective coating of pure zinc by the electro-galvanic process. This coating will withstand bending without fracturing. On the inside is baked a tough, elastic coating of enamel which serves both as a moisture-proof raceway through which wires are easily fished and as an added protection for the wiring system.
YOUNGSTOWN BUCKEYE CONDUIT

Write for this new folder about first aid for wiring protection

Youngstown

BUCKEYE QUALITY YOUNGSTOWN SERVICE CONDUIT

●Youngstown Buckeye Conduit is full-weight rigid steel and is manufactured as Hot Galvanized, Electro-Galvanized and Black Enameled. It is available for immediate delivery in sizes from half inch up to six inches. We can also furnish Electrical Metallic Tubing in sizes from half inch up to two inches.

"4 Ways to Greater Efficiency, Lower Installation Costs" is a new folder giving a full description of each type, with complete information as to wall thicknesses, fittings, etc. Copies are available at no charge to guide you and your customers in the selection of steel conduit. Write for as many as you can use.

Rigid steel conduit is the SAFE raceway approved by the National Electrical Code for all hazardous locations. To be ENTIRELY SAFE use the best, use Youngstown Buckeye Conduit, your first aid for wiring protection.

THE YOUNGSTOWN SHEET AND TUBE COMPANY Manufacturers of Carbon, Alloy and Yoloy Steel

General Offices: Youngstown, Ohio - District Sales Offices in Principal Cities

SHEETS - STRIP - PLATES - STANDARD PIPE - LINE PIPE - OIL COUNTRY TUBULAR GOODS - CONDUIT AND EMT - MECHANICAL TUBING - COLD FINISHED BARS - HOT ROLLED BARS - BAR SHAPES - WIRE - HOT ROLLED RODS - COKE TIN PLATE - ELECTROLYTIC TIN PLATE - RAILROAD TRACK SPIKES

Red Throat

B-M 21 B, THE NEW INSULATED THROAT INDENTER CONNECTOR FOR E. M. T.

Four Ways Finer

1. Protruding rounded red plastic lip of bushing prevents cutting of insulation—eliminates shorts.
2. Full thread screws into all conduit fittings. Lip of RED THROAT bushing protects thread from damage.
3. Deep dished eight pronged lock nut is easier to drive on—screws flush to shoulder and digs into metal of box for vibration proof positive ground.
4. Permanent locked-in bushing insures smooth burr-free raceway for easy fishing. No extra work and costs no more.

Briegel, the Original Indenter Fittings are neater in appearance, easier and faster to use. Installation is simple and less expensive. Two quick squeezes sets them forever. Try B-M Indenter Fittings and get more profits from each job!

ALL BRIEGEL FITTINGS ARE U. L. APPROVED AS CONCRETE-TIGHT

Order from Your Wholesaler!

All B-M Indenter Fittings are U.L. Approved as concrete-tight and for general use (File Card E10863). Also comply With Federal Specifications W-F-406.

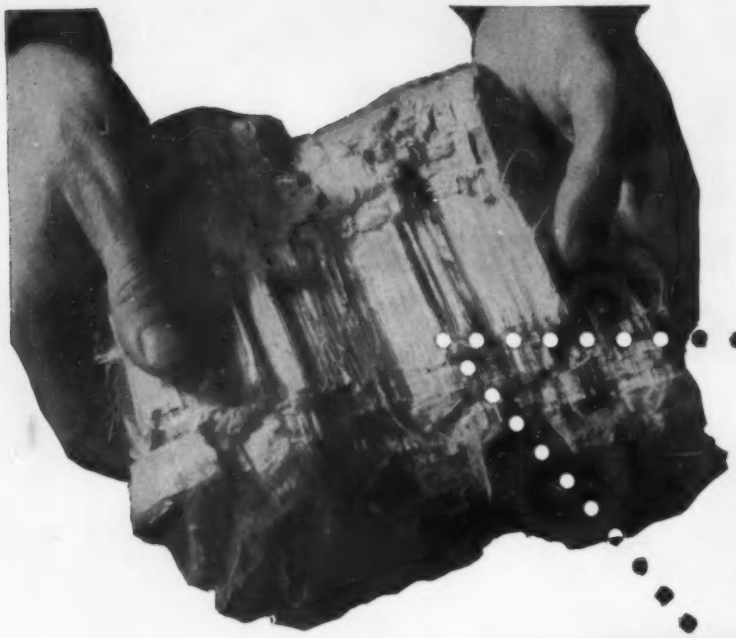
UL

BM SYSTEM

BRIEGEL METHOD TOOL CO.

GALVA • ILLINOIS

Warehouse Stocks in Principal Cities for Immediate Delivery!



From the magic mineral

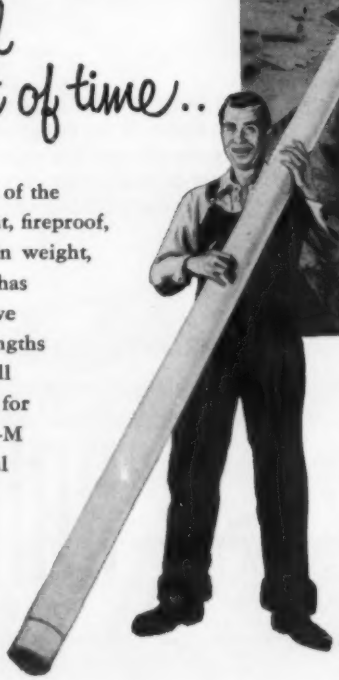
...ASBESTOS

come these strong, durable

TRANSITE DUCTS

made to stand the test of time..

Transite* meets every requirement of the ideal duct material. It is permanent, fireproof, corrosion resistant, strong, light in weight, smooth-bored, non-inductive, and has rapid heat dissipation. No protective coating is required. The 10-foot lengths are rapidly assembled. Transite will outlast other duct materials. Write for new, free brochure showing how J-M Transite Ducts can effect substantial savings in both installation and maintenance of cable subways. Address Johns-Manville, Box 60, New York 16, N. Y. In Canada, 199 Bay St., Toronto 1, Ontario.



Available In Two Types:

TRANSITE CONDUIT

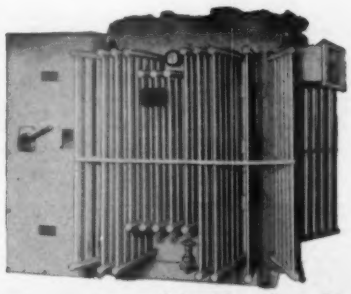
Thick walled, used for exposed work, or buried without concrete casement saves time, labor, materials.

TRANSITE KORDUCT

Thinner walled for installation in concrete. Used for high-voltage lines, its high thermal conductivity cuts operating losses.

JOHNS-MANVILLE JM PRODUCTS

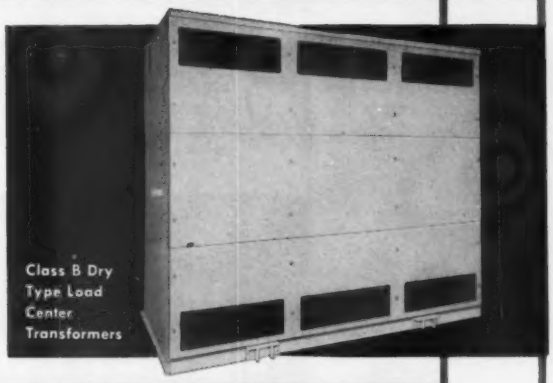
Johns-Manville



Askarel Load Center Transformers

PROTECT YOUR PLANT AGAINST HEART FAILURE

Totally Enclosed Class H and Ventilated Class B Dry Type Transformers



Class B Dry Type Load Center Transformers

Your load centers are the *very heart* of your entire production picture. They must provide a constant supply of power for machinery, materials handling, processing equipment, tools and illumination. Dependability is a load center requisite . . . for profitable, uninterrupted production. Any power failure means lost time, rejects, inefficiency and added costs.

Protect your plant against heart failure. Install dependable Moloney Load Center Transformers and be assured of an uninterrupted flow of power under all operating conditions.

MEE4-52

Nitrogen Sealed Class H Dry Type Load Center Transformers

Moloney Load Center Transformers are noted for dependability and provide these plus features:

1. Location Flexibility
2. Quiet Operation
3. Efficient Operation
4. Low Maintenance Cost

MOLONEY ELECTRIC COMPANY

Power Transformers • Distribution Transformers • Step Voltage Regulators • Regulating Transformers • Load Tap Changing Transformers • Load Center Transformers • Unit Substations • Network Transformers • Constant Current Transformers • Capacitors • Transformers For Electronics

SALES OFFICES IN ALL PRINCIPAL CITIES • FACTORIES AT ST. LOUIS 20, MO. AND TORONTO, ONT., CANADA

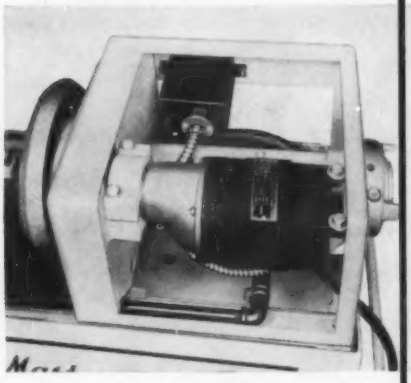
NEW POWER . . . NEW FEATURES . . .

It's the all-new OSTER No. 552 Pipe Master

1 "You can take my word for it. This new model of the famous Oster 'Pipe Master' has everything you could ask for in a portable conduit threading machine. Just look at some of these features...

2 "This die head, for example. It's a quick-opening, adjustable, floating type, with top opening for thread inspection and bottom opening for chip disposal.

3 "And this *exclusive* patented 'Auto Grip' Chuck eliminates the need for bar or chuck wrench. The chuck automatically grips the pipe just as tightly as I want it.



4 "Here's the reason why this new machine threads faster . . . it's a new, more powerful motor. Universal, geared-head type —reversible, variable speed.

5 "It's lighter, too. And for moving it around, just take a look at this special stand, with those big rubber-tired wheels, available as optional equipment."

...the most POWERFUL 2" portable pipe machine on the market!

The all-new No. 552 Oster "Pipe Master" now offers you more for your threading dollar than ever before! Improved design . . . lighter weight . . . and new powerful motor give you even greater value than the famous No. 502 "Pipe Master" which preceded it.

Write *today* for free booklet giving complete information and specifications on the new Model No. 552 "Pipe Master". And make it a point to see a demonstration of this complete portable pipe machine at your Distributor's.

THE

OSTER

MANUFACTURING CO.

Main Office and Factory:

2046 East 61st St., Cleveland 3, Ohio

New York Factory Branch Sales and Service, 25-36 Jackson Ave., Long Island City 1, N.Y.

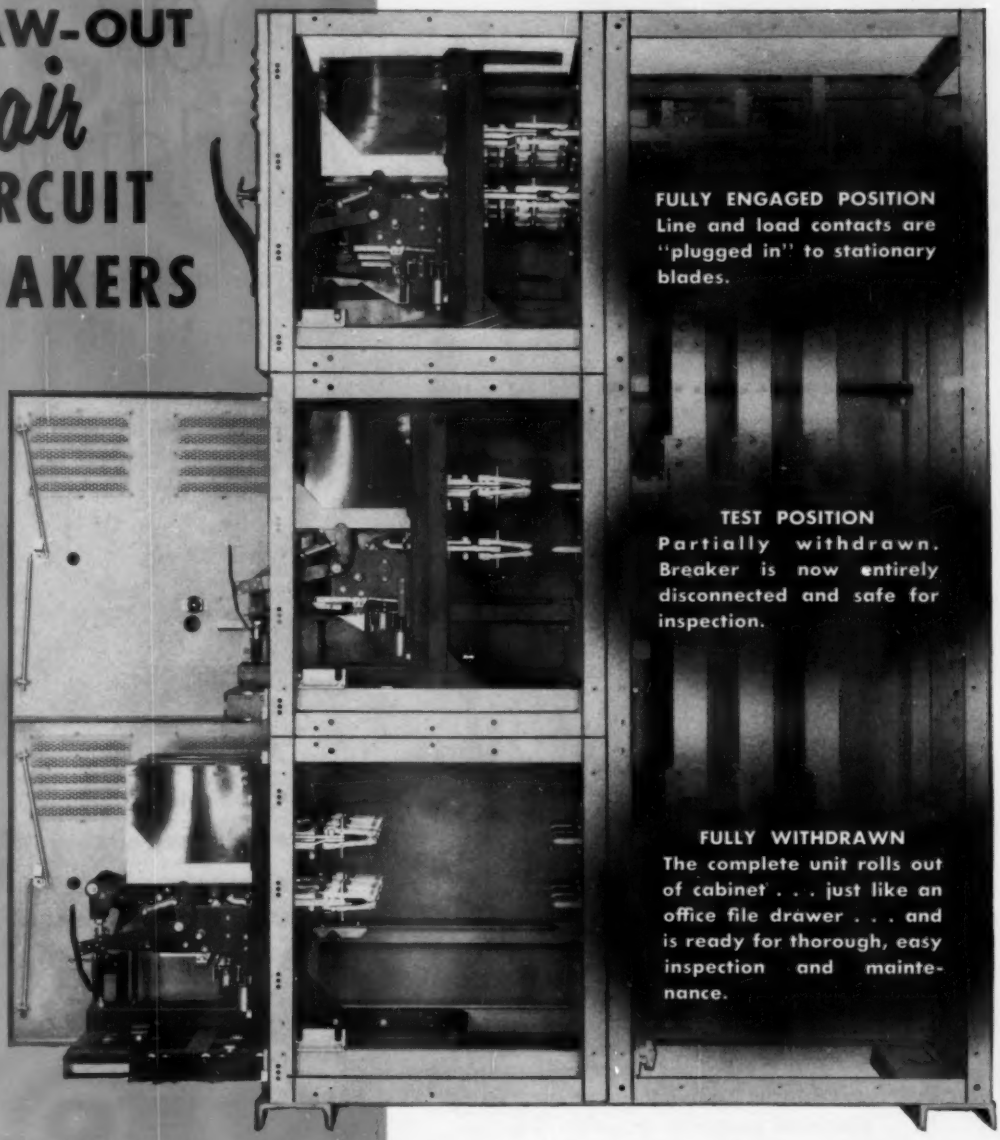
BUILDERS OF LOW COST THREADING EQUIPMENT SINCE 1893

3 STEPS TO SAFE EASY MAINTENANCE with

Roller-Smith

DRAW-OUT air CIRCUIT BREAKERS

"Reading" this picture from top to bottom, you'll see the three easy steps that make Roller-Smith Draw-Out Air Circuit Breakers so safe and simple to install, inspect and maintain. Illustrated, with enclosure side removed, are three 1600 ampere, 600 volt Draw-Out Air Circuit Breakers of 50,000 ampere interrupting capacity.



FULLY ENGAGED POSITION
Line and load contacts are "plugged in" to stationary blades.

TEST POSITION
Partially withdrawn. Breaker is now entirely disconnected and safe for inspection.

FULLY WITHDRAWN
The complete unit rolls out of cabinet . . . just like an office file drawer . . . and is ready for thorough, easy inspection and maintenance.

Roller-Smith
CORPORATION
ELECTRICAL SWITCHGEAR
BETHLEHEM, PENNSYLVANIA

Also available are electrically operated air circuit breakers. In their "test" position, auxiliary contacts remain in circuit to permit operation while line and load contacts are disconnected from stationary blades.

"See A Qualified Electrical Contractor"

AVAILABLE THROUGH AUTHORIZED ELECTRICAL WHOLESALERS

Sales Representatives in all principal cities.
CANADIAN FOREIGN

new additions

to this comprehensive line of

MODERN PRECISION PORTABLES

WESTON 901 LINE

D-C

- Voltmeters
- Volt-Ammeters
- Ammeters
- Milliammeters

A-C

- Voltmeters
- **8 Range Voltmeters** *
- Ammeters
- **7 Range Ammeters** *
- Milliammeters

A-C and D-C single-phase Wattmeters *

Providing unequaled scale visibility due to wrap-around windows, the same rated accuracy of 0.5% and the same efficient shielding of all other instruments in this famous line, these three new additions make the 901 group the most comprehensive line of precision portables available. Complete specifications and prices available in bulletin form, or from the WESTON representative in your vicinity . . . WESTON Electrical Instrument Corporation, 614 Frelinghuysen Avenue, Newark 5, New Jersey.

WESTON
Instruments

. . . Using the Finest Electrical Insulating

Products Made . . . # Dutch Brand

DUTCH BRAND PLASTIC ELECTRICAL TAPES

Thin, strong, flexible with unusual resistance to destructive elements. Three thicknesses: .007", .010", .020".

DUTCH BRAND VINYL COLOR TAPE

Nine colors, four widths for all insulating, coding, indexing. U. L. listed.

DUTCH BRAND RUBBER TAPE

The finest tape of its kind. Resists up to 18,000 volts through a single thickness.

DUTCH BRAND FRICTION TAPE

An industry favorite for over 40 years. For perfect adhesion, for longest life choose Dutch Brand.

"DB" WIRE CONNECTORS

Get full insulation protection from these vibration-proof, weatherproof long skirt connectors.

Get the Best . . . ask for Dutch Brand

Throughout industry Dutch Brand Tapes have earned the top reputation. Why? Because they are made to do the best job. They start with the finest raw materials and process them at every step with the greatest care and skill. The result is a finished product that exceeds the specifications and standards of the industry. Ask your suppliers for Dutch Brand. You are paying for the best—so be sure you're getting it.

JOHNS-MANVILLE DUTCH BRAND VAN CLEEF DIVISION

Johns-Manville

DUTCH BRAND

P R O D U C T S

VAN CLEEF BROS., INC. DIVISION

7800 WOODLAWN AVENUE CHICAGO [illegible] ILL.

A revolutionary new "Silver" finish on the *inside* of all Triangle E.M.T., makes a hard, smooth, clean raceway—a raceway that makes wire pulling 40% easier by actual tests. This new Triangle finish acts like a lubricant for the wire. No "TACKINESS."

"Silver" finished on the inside, galvanized on the outside, Triangle's E.M.T. is thoroughly protected from the corrosive action of moisture, chemicals, oils, greases and fumes.

It Must Be Right
The Trade Mark of TOP Quality
TRIANGLE

TRIANGLE CONDUIT & CABLE CO., INC.

NEW BRUNSWICK, N. J.

Manufacturers of Arteries for Electricity, Liquids and Gases

WIRE • CABLE • CONDUIT • PLASTIC PIPE • BRASS AND COPPER TUBE

PLANTS — NEW BRUNSWICK, N. J.: WIRE AND CABLE PLANT • ROD MILL • BRASS AND COPPER TUBE MILL • PLASTIC PIPE PLANT • **MOUNDSVILLE, W. VA.:** CONDUIT PLANT

WAREHOUSES — BOSTON • CHARLOTTE • CHICAGO • LOS ANGELES • SAN FRANCISCO

now available

from FA distributor's stocks for quick assembly on the job

FA T-M thermal-magnetic trip circuit breaker

LOAD CENTERS and SERVICE EQUIPMENT

Approved by the Underwriters' Laboratories, Inc., for label service, these new FA assemblies embody many features that should make them extremely popular with contractors, and builders, as well as ultimate users.

Besides providing safe, dependable, automatic circuit protection against short circuits and harmless and dangerous overloads, these new units are so designed to make the addition of new circuits, changes in capacities and replacement of damaged units a simple, easy task.

Deliveries, too, are facilitated due to the fact that the new units are of the "panel base assembly" type, which means that all components — box, front, panel-back, bus bar and main lug connection — are available in one complete package from FA distributor's stocks for quick and easy assembly on the job.

An outstanding feature of the new unit is the new FA T-M Thermal-Magnetic Trip Circuit Breaker with quick-make and quick-break operation on manual or automatic trip and FA design magnetic blow-out.

The thermal magnetic action of the circuit breaker automatically trips the handle, indicating the circuit in trouble. Service interruptions caused by harmless, momentary overloads are eliminated, due to the time-lag action of the circuit breaker's thermal element.

On short circuits and dangerous overloads, the magnetic trip hastens the action of the circuit breaker. Once the cause of the trouble is removed, service is restored by flipping the handle back to "off" position and then to "on".

Screwless assembly (just slip the breakers in), one pressure type of connection between circuit breaker and bus bar, and "sequence bussing" to balance the load and permit double pole, individual trip combinations are other features.

Four basic combinations to afford a maximum of 4, 8, 12 and 20 poles (all single pole on combinations of single and double pole) are available. These, plus a supply of dependable, individually-packed single and double pole individual trip FA type T-M Circuit Breakers, available from distributor's shelves, meet almost any job requirement.

For contractors and builders, these new FA assemblies all add up to greater convenience, faster deliveries, and quick and easy installation on the job. So include these units on all jobs requiring Load Centers and Service Equipment. For further details, see your nearest FA distributor, or contact a FA representative, listed in Sweet's.

FA T-M Circuit Breakers are available in the following capacities: 10, 15, 20 and 30 amps., 120 volts AC single pole and/or 120/208 volts AC double pole individual trip; 40 and 50 amp., capacity furnished with FA QP Quicklag P Circuit Breaker; main lugs for 100 amp., maximum, 115/230 volts, 3-wire single phase of 120/208 volts, 4-wire three phase mains. (Six circuits or less suitable for service equipment.)

Frank Adam Electric Co.

BOX 357, MAIN P. O.
ST. LOUIS, MISSOURI

Makers of BUSDUCT • PANELBOARDS • SWITCHBOARDS • SERVICE EQUIPMENT • SAFETY SWITCHES • LOAD CENTERS • QUIKHETER

for men who plan electrical installations and specify electrical materials and equipment...

COMING IN MAY:

YOUR MASTER ELECTRICAL SPECIFICATIONS ISSUE

a reference book of specifications paragraphs and wiring layouts for all types of occupancies

THIS NEW, revised, expanded reference book will cover every phase of interior electrical work — lighting, wiring, power applications, motors and controls, signalling and communications, electric heating.

Electrical contractors, heads of industrial electrical departments, consulting electrical engineers and architects will use it as a guide in planning and writing complete, concise specifications for every type of electrical wiring layout.

Electrical people can use such specifications to prove and sell the benefits of adequate electrical jobs . . . to raise the level of electrical work. Tight electrical specifications help the electrical contractor by establishing a high level on which all job bidding can be based. And if the specification level is high, the proportion of money going into electrical work will be high.

This May issue will present the equivalent of a full-size text-book on planning and writing electrical specifications. Wiring diagrams will illustrate details clearly. The issue will set high standards for exact wording, and for checking the *completeness* of electrical specifications.

The previous Master Electrical Specifications Issue of EL. C. & M. was issued in 1952. After May, it will not be revised and reissued until 1958!

HOW YOU CAN USE THE ISSUE:

1. Each section will be written as specification paragraphs. You can prepare your specifications by copying directly from this master reference. Sections will be coded for quick reference.

2. You can check on the completeness of specifications prepared by others, so that you can present recommendations for changes or additions to sell superior methods or materials.

3. To aid in your selection of products when writing electrical specifications, all products advertised in sufficient detail to be of real assistance — will be listed in a special product index.

Closing date for complete advertising plates: APRIL 15th

A limited number of extra copies of the Master Electrical Specifications Issue will be available at $1 each. Send this coupon now, with your remittance, to make sure additional copies are reserved for you.

ELECTRICAL CONSTRUCTION AND MAINTENANCE
330 West 42nd St., New York 36, N. Y.

Name ..... Title .....

Company .....

City ..... Zone ..... State .....

Number of Copies ..... ☐

ELECTRICAL CONSTRUCTION AND MAINTENANCE

A McGraw-Hill Publication
330 West 42nd Street, New York 36, N. Y.

Wheeler "D" LINE

the "NEW LOOK" in INDUSTRIAL LIGHTING

New design features for better seeing.

1 MORE UPLIGHT

to reduce contrast for seeing comfort. Exceeds new RLM Standards.

2 MORE EFFICIENCY

to start with and higher maintained efficiency due to self cleaning features.

3 MORE PROTECTION

for lamp holders to minimize dirt and moisture problems.

PLUS

all the extra quality features that have distinguished Wheeler lighting fixtures since 1881.

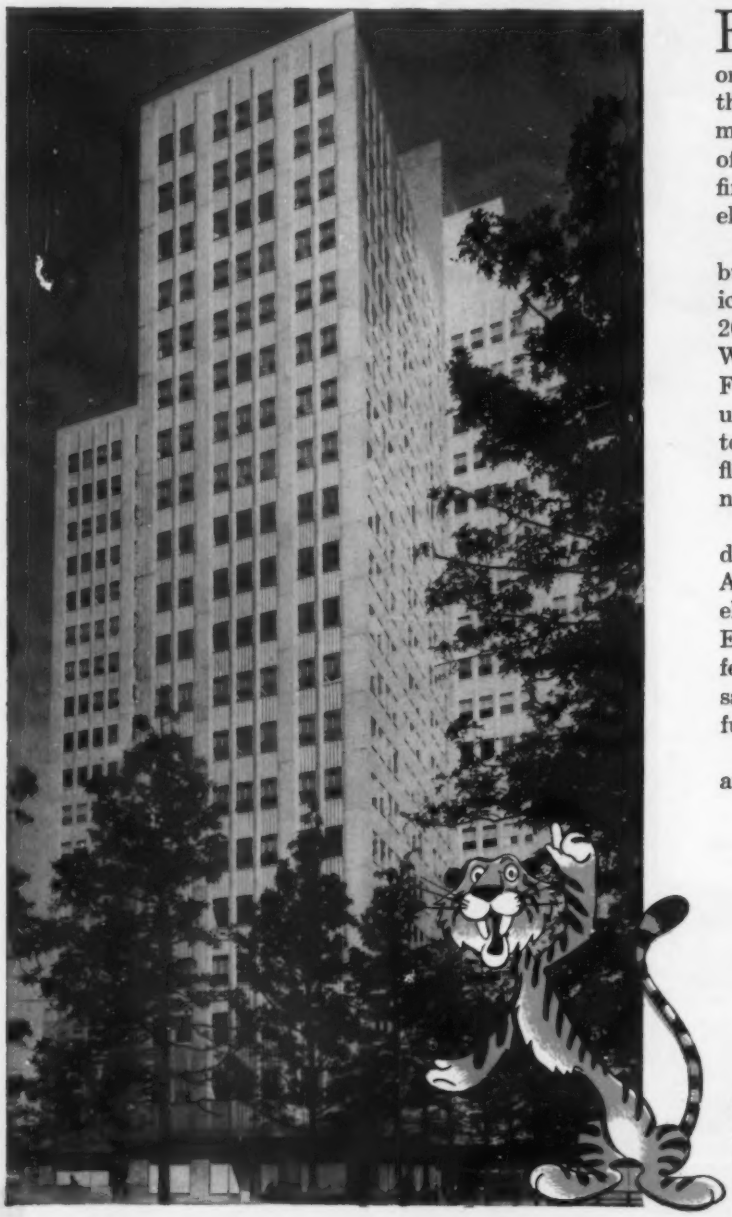
Wheeler REFLECTOR COMPANY

Distributed Exclusively through Electrical Wholesalers

WHEELER

275 CONGRESS STREET, BOSTON 10, MASSACHUSETTS

6 miles of TIGER BRAND control the elevators in new Gateway Center buildings



ELEVATOR CONTROL CABLE leads a tough life. It must be light, to reduce the load on the car. It must be flexible, to withstand the continuous movement and vibration. It must be strong, to prevent the long length of cable from tearing itself apart. It must be fire-resistant, to guard against disastrous elevator shaft fires.

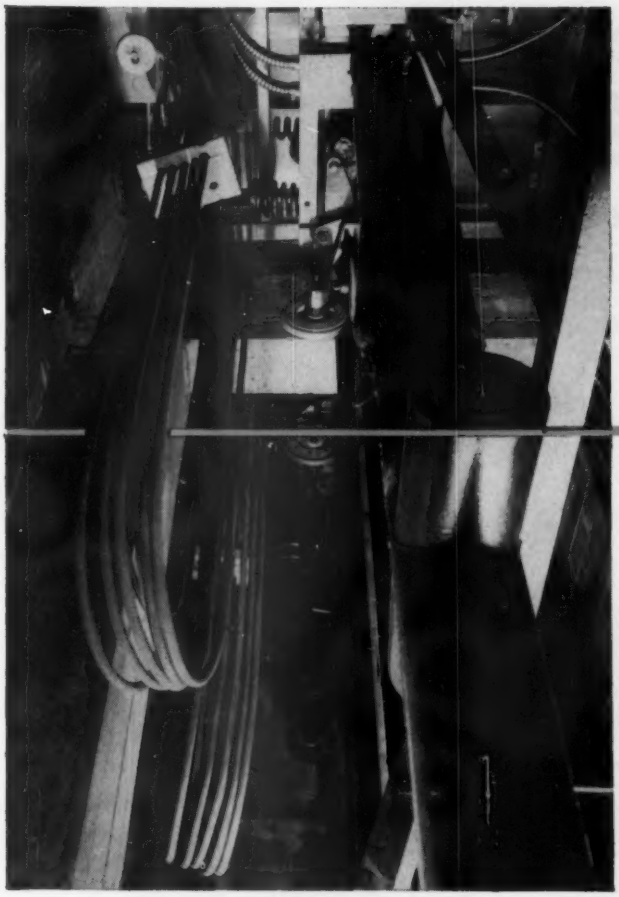
For the magnificent Gateway Center buildings in Pittsburgh, shown here, American Steel & Wire furnished some 6 miles of 20 and 30-conductor control cable for the Westinghouse Selectomatic elevators. Flame-resistant insulation and jackets are used, and each cable is reinforced with tough steel strands. The cable had to be flexible enough to withstand movement, but not so flexible that it would kink.

These are desirable features for many different kinds of electrical wire and cable. And although you probably don't build elevators, you can rely on any Tiger Brand Electrical product to combine all the subtle features that make for easy installation, safe, reliable operation, plus a long and useful life.

Send the coupon for more information on any Tiger Brand product.

AMERICAN STEEL & WIRE DIVISION,
UNITED STATES STEEL CORPORATION
GENERAL OFFICES: CLEVELAND, OHIO
COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO,
PACIFIC COAST DISTRIBUTORS
TENNESSEE COAL & IRON DIVISION, FAIRFIELD, ALA.,
SOUTHERN DISTRIBUTORS
UNITED STATES STEEL EXPORT COMPANY, NEW YORK

Gateway Center, famous Pittsburgh landmark, where Westinghouse Selectomatic Elevatoring matches calls, cars and floors to put elevators where they're needed, when they're needed.



Tiger Brand control cables are at the left. The hoist ropes, visible at right, are also made by American Steel & Wire.

Control cable terminal box is located half-way up the shaft. Flat steel rods projecting from elevator track actuate induction coil on car to control automatic leveling system.

A STANDARD TIGER BRAND CABLE FOR EVERY SPECIAL JOB!

- paper & varnished cambric cable
- asbestos wire and cable
- aerial, underground & submarine cable
- shovel & dredge cable
- mold cured portable cord
- machine tool & building wire
- special purpose wire & cable

SEND THE COUPON

American Steel & Wire Division
Room AE-25, Rockefeller Building
Cleveland 13, Ohio
Please give me more information about Tiger Brand cable for .....
Name .....
Firm .....
Address .....
City ..... State .....

USS Tiger Brand ELECTRICAL WIRE & CABLE

UNITED STATES STEEL

"Talk-Don't Walk"

MODERN BUILDING PLANS SPECIFY COMPLETE INTER-COM SYSTEMS

Good inter-com systems are just as accepted as a part of today's architecture as its modern design. Permanently built-in communication systems naturally include the long-life, trouble-free characteristics provided by Belden Inter-Com Cables.

There is a specialized Belden Cable for every inter-com or sound system requirement.

Belden Manufacturing Co.
4623-A W. Van Buren St.
Chicago 44, Ill.

For *Permanent* Installations
For Profitable Work

FOR EVERY TYPE OF INSTALLATION
FOR EVERY TYPE OF EQUIPMENT
BELDEN HAS THE CABLE BUILT TO
SPECIFICATIONS

Belden Inter-com CABLE

NEW! IMPROVED COMPLETE LINE OF RACO

HANDY BOXES AND COVERS

COVER SCREW

Cover mounting screws are assembled and self-retained in covers. Cannot shake out, but easily removed if desired. No fiber washers or extra parts used to retain screws.

Bright Plated Finish on Covers and Boxes

Integral Ears

Deeper Cover Neater Appearance

Uniform Weight One-Piece Box! Corners are full metal thickness smoothly rounded and strong . . . won't crack

Knockouts Easily Removed

Strong Flat Bottom for Easier, Firmer Mounting

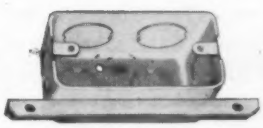
OVERLAPPING COVERS FOR EVERY WIRING REQUIREMENT!

No. 860 No. 861 No. 863 No. 864 No. 865 No. 866

RACO HANDY BOXES ARE ONE PIECE DRAWN STEEL!

Standard Sizes—4" long, 2⅛" wide by 1½", 1⅞" or 2⅛" deep

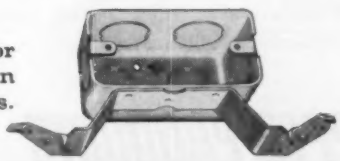
Available with or without brackets in all sizes



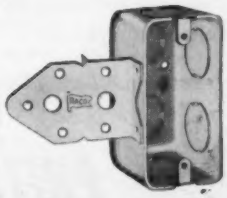
A Bracket, ½" knockouts in 1½" and 1⅞" deep boxes. Either ½" or ¾" knockouts in 2⅛" deep boxes.

F Bracket, ½" knockouts in 1½" and 1⅞" deep boxes.

O Bracket, ½" or ¾" knockouts in 2⅛" deep boxes.



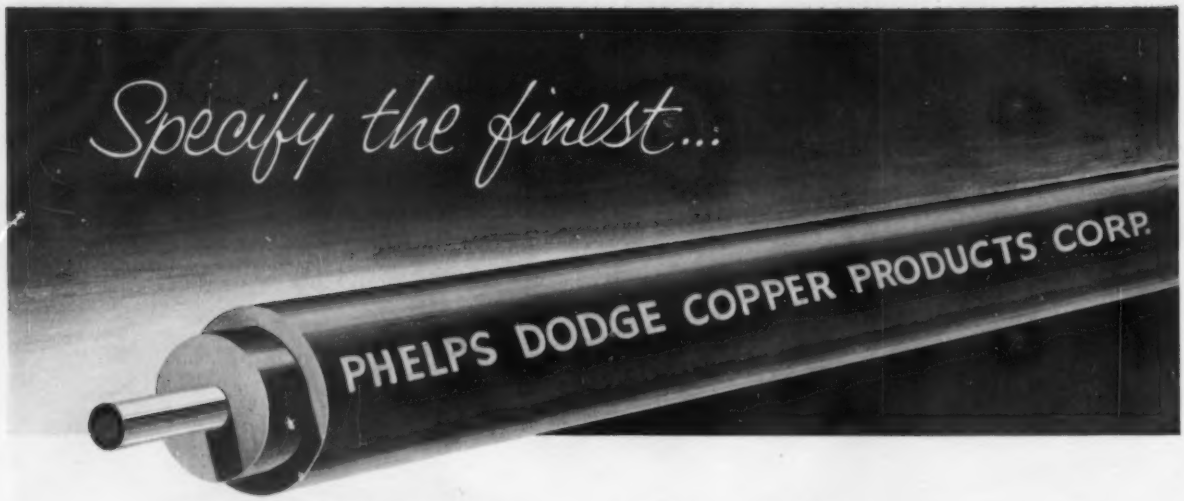
B Bracket, ½" or ¾" knockouts in 1½" and 2⅛" deep boxes.



ASE RACO

"A RACO BOX FOR EVERY NEED"

ALL-STEEL EQUIPMENT INC. Aurora, Illinois



Phelps Dodge Habirite-Habirprene!

Rely on this highest quality cable—it works where others fail

The term "RR" is only a name, not an assurance of quality. Instead of ordering just "RR" cable, insist on Phelps Dodge Habirite-Habirprene—developed through years of experience in designing and making high voltage cables. Habirite-Habirprene exceeds the trade's highest standards of quality and reliability.

Phelps Dodge Habirite insulation, a specially engineered butyl rubber compound, has a service dependability record unapproached by any other type of rubber insulation. Habirite is greatly superior to old-fashioned insulations for these reasons:

- Much greater resistance to heat and oxidation. This permits a higher temperature rating, with consequent reduction in conductor size and in cable cost.
- Much greater resistance to ozone—present around high voltage equipment.
- Much greater mechanical toughness affording maximum protection against damage from tools, stones and other installation hazards.
- Better electrical properties—giving a greater safety factor in operation.
- Maximum uniformity of finished product—due to controllable uniformity of raw materials.
- Elimination of seams which cause weak spots—through use of Phelps Dodge extrusion insulating process.

Phelps Dodge Habirprene sheath, a unique neoprene compound, is especially made to be extra resistant to corona, one of the worst enemies of high voltage cable. This *extra resistance to corona* is an exclusive Phelps Dodge feature. It provides a greater safety factor in operation and has contributed to the remarkable reputation and service record of Habirite-Habirprene.

When you specify Habirite-Habirprene, you are assured of getting "RR" cable with the utmost in safety and durability. Habirite-Habirprene is the result of Phelps Dodge's rigid quality standards, long experience, expert engineering and vast facilities.

PHELPS DODGE COPPER PRODUCTS CORPORATION

SALES OFFICES: Atlanta, Boston, Buffalo, Charlotte, Chicago, Cincinnati, Cleveland, Dallas, Detroit, Fort Wayne, Greensboro, N. C., Houston, Jacksonville, Kansas City, Mo., Los Angeles, Milwaukee, Minneapolis, New Orleans, New York, Philadelphia, Pittsburgh, Portland, Ore., Richmond, Roanoke, San Francisco, St. Louis, Seattle, Washington, D. C.

ELECTRICAL CONSTRUCTION AND MAINTENANCE

54th Year—FEBRUARY • 1955

Atoms for Power

Now that the Atomic Energy Commission is actively encouraging private initiative in the field of atomic power, we can expect many plans to reach the construction stage in the relatively near future. By 1957 or thereabouts some people may be broiling the breakfast bacon with atomic kilowatts.

No "crash" programs are likely. We are enormously rich in cheap fossil fuels and untapped water power resources. There is still much to be learned about designing, building and operating atomic power plants. The relatively small plants now in prospect will provide valuable data for the bigger plants which must be built before nuclear energy can provide any substantial fraction of our total power requirements.

For the short term the impact of nuclear energy electric power is not going to be sudden or especially spectacular. Atomic kilowatts may turn out to be cheaper at the bus bar. Transmission and distribution, however, will continue to be conventional and atomic kilowatts will have no distinguishing characteristics at the outlet.

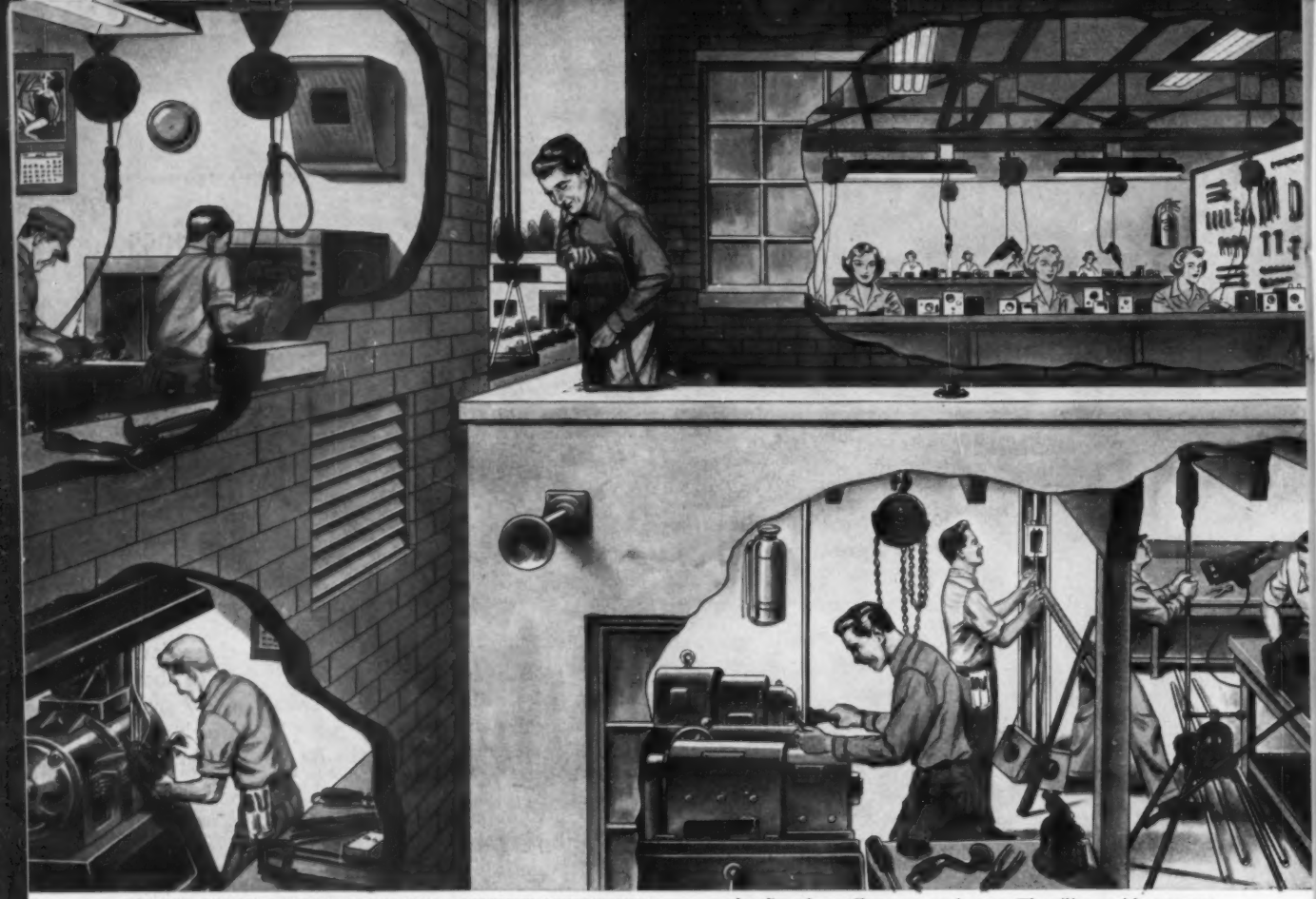
For the long term, the nuclear reactor offers a new and virtually unlimited resource of prime energy for electric power with the important advantage that plants may be located to the best advantage for the loads to be served. Hydro plants must be built at the natural resource. Fuel-fired plants must be located where they are conveniently served by low cost transportation from abundant and cheap source of fuel. The small physical quantities of "fuel" used in nuclear reactors make distance and means of transportation relatively inconsequential.

The larger public benefits of power from the atom are most likely to come from the entirely pedestrian job of load building that it will inspire. We must learn how to apply and use electricity abundantly, for many tasks and services which may appear impractical or even visionary today, before we can realize the true potential of this elementary energy of the universe.

In the development of uses to match the capabilities of atomic power, wiring systems will play an increasingly important role. Conventional design practices, which tend to be sparing of copper and system capacity, leave small margins to accommodate new loads. Any substantial growth will surely have to be served with new wiring.

The present state of atomic power development offers few clues to what the future holds. But the distribution and use of the new energy almost certainly will be electrical and a very big job for the electrical construction industry.

Wm. T. Stuart



GRAYBAR CAN SUPPLY VIRTUALLY ANY PORTABLE ELECTRICAL TOOL needed for plant production line, construction, or maintenance work. Just call your local Graybar Representative or nearby Graybar office or warehouse. They'll provide prompt, accurate price and specification data on tools as well as any of your other electrical needs.

The right tools get the job done faster

FREE . . . Graybar Tool Catalog

64 pages of price and ordering information make this one of the most comprehensive tool catalogs ever published. Hand tools, motor-driven tools, and miscellaneous supplies for every electrical construction or maintenance need are listed. Write, today, for your free copy.

Better tools make better workers . . . work goes faster, and more smoothly with quality tools built for the job.

Check your tool inventory, today – then order the hand or portable power tools you need . . . via Graybar.

For, as with all of your electrical needs, Graybar offers a specialized service in their procurement.

- **Well-known makes** – of proved design and construction for hard usage.
- **Availability** – via more than 110 strategically-located Graybar offices and warehouses.
- **One source . . . one responsibility** – through centralization of all order assembly, shipping, and billing functions.
- **Graybar Specialists** – men with years of experience in all of the major electrical fields to advise and consult with you and your customers.
- **Everything Electrical** – for plant maintenance and construction. Over 100,000 items . . . the products of over 300 leading manufacturers.

424-42

CALL GRAYBAR FIRST FOR...

GraybaR ELECTRIC CO., INC.
420 Lexington Ave., New York 17, N. Y.

GraybaR Everything Electrical

IN OVER 110 PRINCIPAL CITIES

ELECTRICAL CONSTRUCTION AND MAINTENANCE

JUDGES for Lighting Competition were three professional illuminating engineers: Thomas F. Coghlan, Washington, D. C.; C. L. Crouch, and Richard Kelly, New York City.

First Prize Award Winners In

LIGHTING COMPETITION

How electrical contractors initiate, sell and install outstanding lighting systems across the nation is revealed by the six First Prize Awards in the 1954 Lighting Competition sponsored by *Electrical Construction and Maintenance*.

LIGHTING progress continues to swing along at record pace. Current lighting installations are of better quality — higher intensities, lower brightness ratios, improved equipment design, better maintenance features, and more artistic appearance. And the new lighting systems provide more value per dollar, even though their cost per square foot is still on the increase.

It is estimated that lighting equipment sales in 1955, for commercial, industrial, floodlighting, and residential (excluding residential portable lamps) will total about $390 million, up some 30% over the 1952 rate of an estimated $300 million reported by the Government's National Production Authority handling production controls during the Korean war. These figures represent net billings by manufacturers. Thus the installed cost of this equipment for ultimate consumers represents a market of an estimated $550 million, plus wiring costs, or an electrical construction market of over one billion dollars for this lighting equipment and its related wiring.

There are sound reasons for this spectacular increase in lighting sales. For example, three years ago Government controls on lighting equipment production and new building construction had slowed down sales considerably below demand. In the three years since, new building construction has climbed from an approximate $30 billion dollar rate at the beginning of 1952 to a current rate of $39.5 billion predicted for 1955, or up some 31.5%. Also, modernization of old buildings, especially relighting, has gone ahead at an even faster rate. Thus, when these factors are all combined, it is readily seen that the predictions for increases in lighting sales are most conservative.

One of the objectives of the second national Lighting Competition, sponsored by *Electrical Construction and Maintenance* exclusively for electrical contractors and their employees during 1954, was to stress the part played by them in the initiation, promotion and sale of lighting equipment. This is herein accomplished through publication of case histories submitted by contractors and their employees as their entries in the contest. Six such entries, those awarded First Prize in each of the six lighting classifications used in the contest, are presented on the following 17 pages. A study of these entries is most revealing. It shows how contractors promote and sell more and better quality lighting, with many inherent customer benefits, for the homes, factories, stores, schools, offices, and buildings of all types, day after day, in towns and cities throughout the nation.

LIGHTING COMPETITION

RESIDENTIAL LIGHTING

WINNER . . . . Jerry F. Burt
Burt Electric Company
Fallbrook, Calif.

PROJECT . . . . Burt Residence
Fallbrook, Calif.

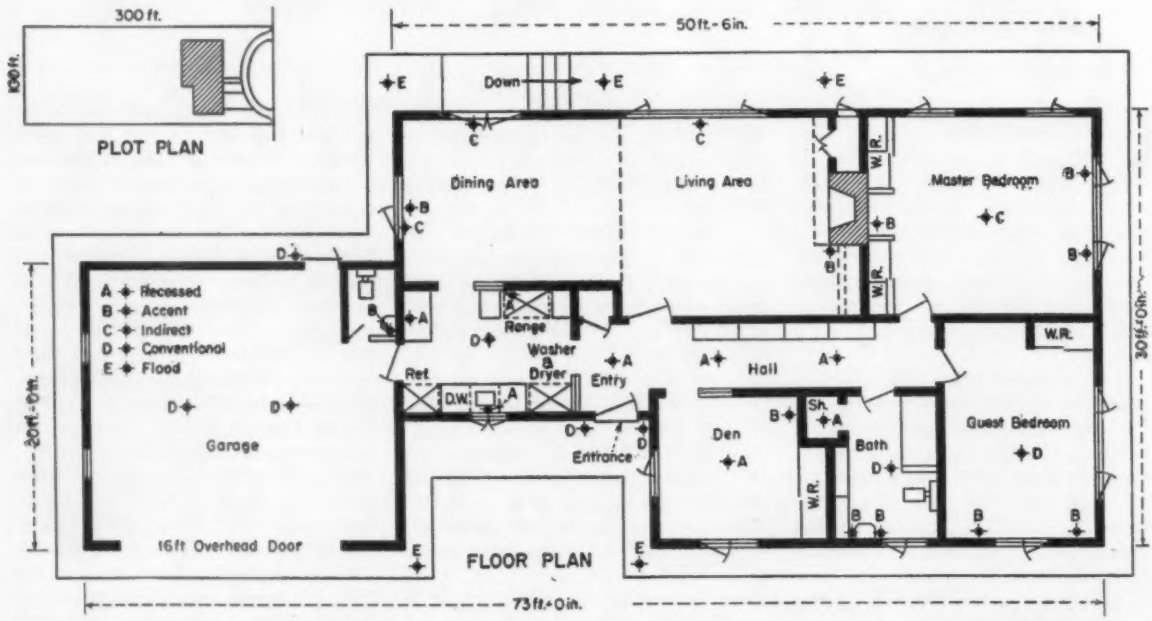
ENTRANCE of Fallbrook, California residence of Mr. and Mrs. Jerry F. Burt, electrical contractor, is made inviting with light. Illuminated house number is at left. Four adjustable floodlights bathe entrance with white light, while two exterior wall brackets, using yellow lamps to repel insects, focus attention on front door.

Contractor Displays

LIGHT FOR LIVING *in Own Home*

A LIGHTING system which is serving a dual role has been installed in the new home of Mr. and Mrs. Jerry F. Burt, Farlbrook, Calif. This system provides modern light for living, with all its benefits and advantages, and also serves as a model demonstration of various types of lighting and lighting equipment, which Jerry Burt, electrical contractor, uses with his customers. Included as part of the demonstration is a highly flexible wiring system with multiple switch controls, and a wide variety of electrical appliances for home use.

The lighting was selected primarily to demonstrate modern lighting equipment, available at moderate cost. It includes direct, indirect, and accent lighting, and lighting for television viewing, as well as conventional light-



LIGHTING LAYOUT for entire house, with overall dimensions, is shown in the above plan. The house is also adequately wired, and multiple switch controls are used throughout for maximum convenience and for lighting flexibility.

ing equipment for miscellaneous household seeing tasks. Featured is indirect light for television viewing, direct light for reading, dining, make-up and shaving, direct light for kitchen seeing tasks, and exterior yard lighting. Both fluorescent and incandescent lamps were used.

As will be seen in the accompanying "Schedule of Lighting Equipment", units were selected from a number of manufacturers. Each unit was chosen because of its lamp capacity for ample light for each application, and because of its appearance from a decorative point of view. All units conform with the contemporary design theme of the house and its furnishings. All are of good quality, yet none are expensive, proving that good lighting and quality equipment are both within the reach of every home owner of average means. All units are also easily relamped by the homeowner, a feature pointed out to each customer.

The house itself is a modern six room design, with entry, hall, bath and two-car garage. The living and dining areas are one common open area. The interior contains 1362 square feet of area, and has a connected lighting load of 2300 watts. The connected lighting load for the exterior and the garage area is 1250 watts.

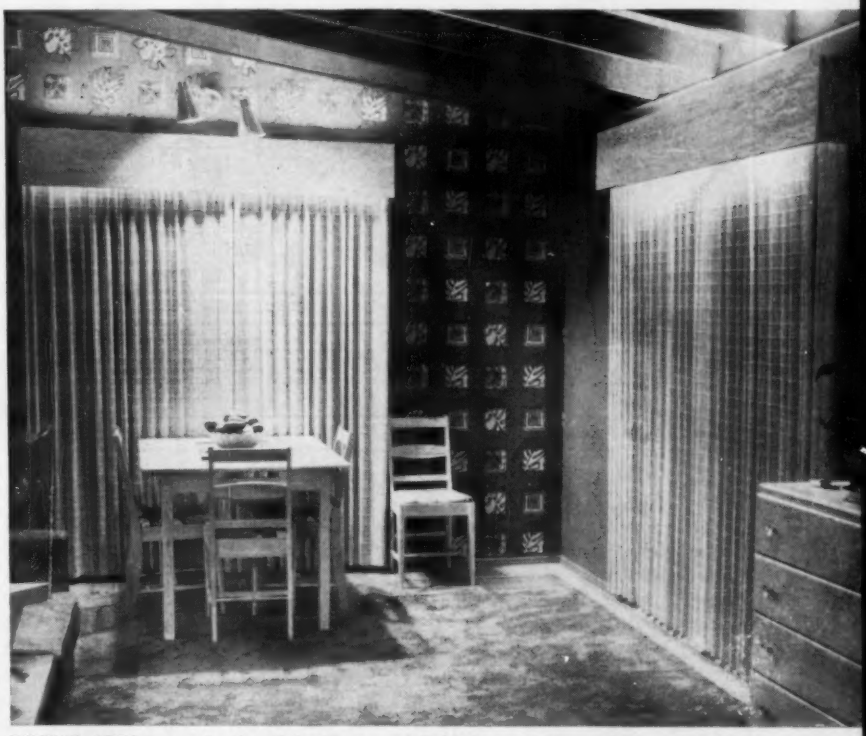
Valance lighting provides indirect light in the living room, which is used for television viewing. This lights the room well for most activities except reading and sewing, yet it permits easy seeing of the TV screen without glare.

Shaded swivel-type units provide direct light over the dining table, over the dressing table in the bedroom for applying make-up, over the bathroom mirror for shaving, and for in-bed reading. The bed reading lamps in the master bedroom are installed over the headboard and plugged into Plugmold. In the guest bedroom and den, pin-up type lamps are used.

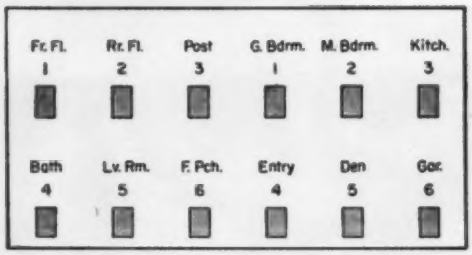
Kitchen lighting consists of units recessed under wall cabinets to light the electric range and typical work counter areas, and recessed in the ceiling over the sink to light this work area.

Yard lighting is done with lamps in swivel lampholders and shaded swivel units mounted under the roof overhang, and by post lights. These are controlled by switches located at convenient places, and also from low voltage master control panels—one in the garage, and one in the master bedroom. One of the garage lights is turned on by an automatic switch combined with the automatic garage door opener, for added convenience.

LIVING ROOM is lighted with deluxe warm white fluorescent lamps behind window valance for true color rendition, by accent light on bookcase behind TV set, and by portable end table lamps used for reading. TV viewing is done with indirect valance lighting only, which permits screen to be seen perfectly without glare or light reflections, and with a minimum of contrast by the lighted TV screen.



DINING AREA is made cheerful with accent lighting on dining table, and indirect lighting on and over windows from valances using deluxe warm white fluorescent lamps. Valance lighting only provides a warm, decorative effect.



MASTER PANEL for low voltage control of lighting circuits controls all interior and exterior lighting. Two panels are used, one in master bedroom, and one in garage.

BEDROOM has accent lights over bed headboard for in-bed reading, also center conventional unit for indirect lighting. Wall panel between beds is central low voltage control panel for all interior and exterior lighting.

SCHEDULE OF LIGHTING EQUIPMENT

Location	Mfgr.	Description		Lamps		Mounting
		Quan	Cat. No.	Quan	Type	
Living Room	Allbrite	1	25112	2	72T12/wwx	Direct
	EJS	1	50	1	75w IF	Direct
Dining Room	EJS	1	54-2	2	100w IF	Direct
	Allbrite	2	25172	2	72T12/wwx	Direct
Kitchen	Marco	1	310-R	1	75R30/Fl	Recessed
	Progress	1	2508	2	60w IF	Direct
	Kelvinator	2	L	2	15T12/ww	Recessed
Entry	Marco	1	310-R	1	75R30/Fl	Recessed
Hall	Pryne	2	159	2	60w IF	Recessed
Bath	Progress	1	2508	2	60w IF	Direct
	EJS	2	50	2	100w IF	Direct
Shower	Pryne	1	159-VP	1	60w IF	Recessed
Guest Bedroom	Moe	1	224	2	75w IF	Direct
	Swivelier	2	H90	2	60w IF	Pin-Up
Den	Marco	1	J10-91	1	100w IF	Recessed
	Swivelier	1	H90	1	75w IF	Pin-Up
Master Bedroom	Moe	1	1071	1	150w IF	Stem
	Moe	1	1067	2	100w IF	Direct
	EJS	2	58	2	75w IF	Portable
Front Exterior	Moe	2	888	2	60w/Y	Direct
	Swivelier	2	H257	4	75R30/Fl	Direct
Posts	Artolier	2	202	2	60w IF	Post
Rear Exterior	Starlight	1	SL730	1	60w IF	Direct
	Swivelier	3	537L	3	150wPAR/Fl	Direct
½ Bath	EJS	1	50	1	100w IF	Direct
Garage	Monowatt	2	1626-7	2	100w IF	Direct

BATHROOM has accent lights at top of mirror, one on each side, plus center ceiling light. Shower stall also has recessed vapor proof unit.

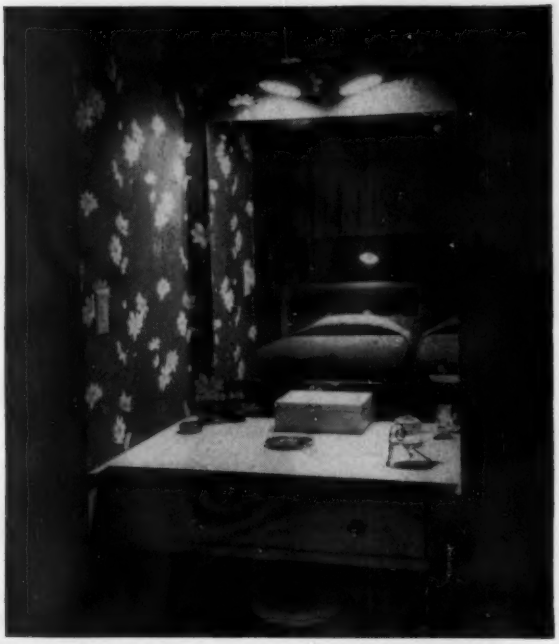
LIGHTING UNITS were selected which would provide good lighting yet harmonize with area where used. (Table at left)

Jerry and Catherine Burt selected all lighting units, keeping in mind the two functions required of all units. This meant searching the catalogs of several lighting equipment manufacturers to find the units best suited for their end applications. These units were then purchased through local distributors, including Graybar Electric Co., Inc. and Coast Electric Co., San Diego, and Brown Wholesale Electric Co., Los Angeles. All lamps used are General Electric.

All luminaires fit into the contemporary modern design of the house and furnishings. In the living room the accent units are brass, which matches well with the browns, greens, and light color woods. In the bathroom, the accent lights are brown, to match the brown tile and draperies. In the master bedroom the units are black and brass, to provide a strong contrast to the light gray walls, furnishings, and pink draperies. In the guest bedroom and den, the pin-up accent lights are dark green, which contrast with the light green walls harmoniously. Kitchen and shower units are chrome, to match appliances and hardware.

After having lived in this new home for nearly one year, its owners comment that the various lighting effects are all more than satisfactory. All lighting units serve the purposes for which they were intended, they report, including the practical one of selling more and better lighting to customers who see the installation.

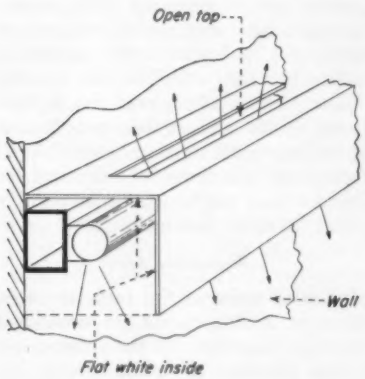
RECESSED fluorescent units in bottom of cabinets provide a flood of light over the electric range and work counters. A center ceiling unit provides general lighting.



DRESSING TABLE in wall niche of master bedroom is lighted by two accent lights for good seeing conditions in applying makeup. Note bedlamp across room reflected by mirror.

KITCHEN SINK is flooded with light from unit recessed in ceiling above.

REAR of house and lawn is floodlighted by PAR-38 type lamps, and by bracket at side of garage door.



VALANCE LIGHTING DETAIL

COLORS AND REFLECTANCES OF ROOM INTERIORS

Location	Ceiling		Walls		Floor		Furniture	
	Color	RF	Color	RF	Color	RF	Color	RF
Living-Dining	White	87%						
	Brown						Dark	
	Beams	12%	Brown	13%	Brown	15%	Green	12%
Entry & Hall	Pink	69%	Pink	69%	Wood	38%	Pink	74%
Master Bedroom	Gray	52%	Gray	52%	Rose	31%	Blonde	38%
Guest Bedroom*	Green	61%	Green	61%	Taupe	43%	Blonde	48%
Den	Green	61%	Green	61%	Brown	15%	Blonde	48%
Bath	Gray	52%	Gray	52%	Gray	45%	White	87%
Kitchen**	Green	40%	Green	14%	Green	40%	White	87%

*Bedspreads, dark green — 10% RF. **Counter tops, light green — 63% RF.

LIGHTING COMPETITION

OFFICE LIGHTING

WINNER . . . . John O. Kvalsten, Vice President
Kvalsten Electric Company, Inc.
Minneapolis, Minn.

PROJECT . . . . Campbell-Mithun, Inc.
Minneapolis, Minn.

OFFICE LIGHTING IMPLEMENTS INTERIOR DESIGN

LUMINOUS ELEMENT in ceiling at end of wall attracts attention to reception desk in reception area of new executive office suite.

CUSTOM LIGHTING in President's office creates cheerful atmosphere, provides light for decorative as well as functional use. Swivel units in ceiling light side walls while contilevered luminous element provides 50 footcandles on desk.

A LIGHTING installation embodying the most advanced practices in the art of lighting today is what Campbell-Mithun, Inc., advertising agency, demanded when they set up their present suite of offices. They now occupy a space in the Northwestern Bank Building, Minneapolis, Minn., formerly used for general office work. Cost was not to be a factor. The atmosphere in the entire area was to be warm and interesting, and the lighting was to provide not only adequate levels for the seeing tasks involved, but also comfortable brightness patterns. The details of the lighting were also to conform and harmonize with the interior design treatment. Just how well these objectives were met is visually shown in the accompanying photographs, and interestingly revealed by the lighting design and layout shown by the plan and sketches of the equipment.

The new offices, completed and moved into in February 1954, consist of five rooms: a reception area, private office and conference room, secretarial office, small private office, and a casual room. These offices comprise a total area of 969 square feet, and have a total connected lighting load of 5,150 watts, or an average of 5.3 watts per square foot. Lighting intensities vary from 10 to 80 footcandles.

Reception Area

Seeing tasks in the reception area are not severe, except for occasional typing. However, ample lighting has been provided to fulfill several objectives.

A luminous element (Type J) was

installed flush in the ceiling at one end of the room, designed to attract attention to the receptionist on entering the room and provides a satisfactory level of soft and diffused, comfortable illumination. It contains six 40-watt T12 rapid start deluxe warm white fluorescent lamps, which are operated at 430 ma by remotely located ballasts. The exterior flange is polished bronze, and the rib dividing the two corrugated plastic sections in antique walnut.

An ornamental bracket (Type M) equipped with a standard 60-watt inside frost lamp was installed on the wall at one end of the receptionist's desk, to provide a point of interest in the room.

Two 150-watt PAR-38 recessed downlights (Type K) provide a high intensity of reading light for those waiting for appointments.

In addition, two 50/150-watt type CLM table lamps are used to light the end of the room opposite the receptionist, which also adds decorative interest and variable brightness patterns.

President's Office and Conference Room

The President's office is a large room which is used as a private office; also for presentation of proposals to clientele, and for staff meetings. Advertising proposals are mounted on the burlap walls for presentation to clients. Sufficient components of vertical illumination were desired to adequately illuminate these proposals for easy viewing.

The lighting provided for this area consists of a special cantilevered luminaire (Type E), two fixed (Type G) and four adjustable (Type H) recessed downlights, and two 50/150-watt type CLM table lamps.

The special design cantilevered luminaire is located over the President's desk 7 feet 3 inches from the floor to the bottom of the unit. It contains six 72T8 fluorescent lamps, all operated at 200 ma from ballasts located remotely to minimize noise and to keep the luminaire dimensions within certain limits. This luminaire is open on top to provide general diffused illumination from the upward light component, and to soften shadows around the room. It has corrugated Plexiglas plastic diffusers on the bottom which provides diffused direct light to the desk top. This luminaire is made of wood, finished antique walnut, and it ties in perfectly with the decorating scheme in the room. It provides over 50 footcandles maintained on the top of the desk, with a relatively low brightness of 235 footlamberts on the plastic. It is so placed with reference to the desk that no reflected image of it appears in the desk top from normal viewing angles.

The four recessed swivel downlights (Type H) provide floor brightness, but are used primarily to light advertising proposals, pictures, products, etc., displayed on the wall around the room perimeter.

Two table lamps are used, one at either end of a sofa located against the wall opposite the desk, and are used to provide general atmosphere lighting.

Secretarial Office

Three levels of illumination are provided for the secretarial office, where general secretarial work is done. Two recessed troffers, one 12 feet long and one 16 feet long, extend along the length of the room, with one on one side and the other on the opposite side. These troffers (Type D) are equipped with Holophane No. 9040 controlenses, in hinged frames for easy maintenance, to shield and diffuse the light. Each unit also has three 40-watt T12 rapid start fluorescent lamps, with the center lamps wired for separate control, to provide three-level lighting. A maximum intensity of 70 footcandles maintained average is obtained at the desk positions when all lamps are turned on.

Vice President's Office

Lighting for general office work and interviews establish the seeing tasks involved in the Vice President's private office. To solve this problem a six-panel ceiling unit (Type A) using arched plastic diffusers supported by acoustical baffles was used, with a 50/150-watt type CLM table lamp in one corner to add brightness variation and a touch of warmth.

Above the plastic panels are 12 96T12 fluorescent slimline lamps, all operated at 430 ma current. Six of these are deluxe warm white and six are deluxe cool white. Each set of six lamps is separately controlled. This permits three different color environments, and three separate lighting intensities. to be switched on as desired.

Casual Room

A casual room, lighted to an intensity of 30 footcandles, is used for coffee breaks, a coat room, etc. It contains cooking and refrigeration units, and is suitably equipped for serving refreshments.

General lighting is provided by three two-lamp surface-mounted direct-indirect type fluorescent units installed end-to-end (Type C), with plastic sides, and suspended five inches from the ceiling. A 40-watt T12 lamp under a wall cupboard and two 75-watt R30 downlights (Type B) provide 40 footcandles on the work area at the heating units and counter-height refrigerator.

LUMINOUS PANELS and acoustical baffles form ceiling in Vice President's office. Use of two different colors of "white" fluorescent lamps, each on different switch control, provides flexible atmosphere for room.

All fluorescent lamps used in this installation are deluxe warm white (except for 6 deluxe cool white lamps in Vice President's office), selected as the most satisfactory for the decorative scheme used throughout. General Electric lamps are used in all luminaires and equipment.

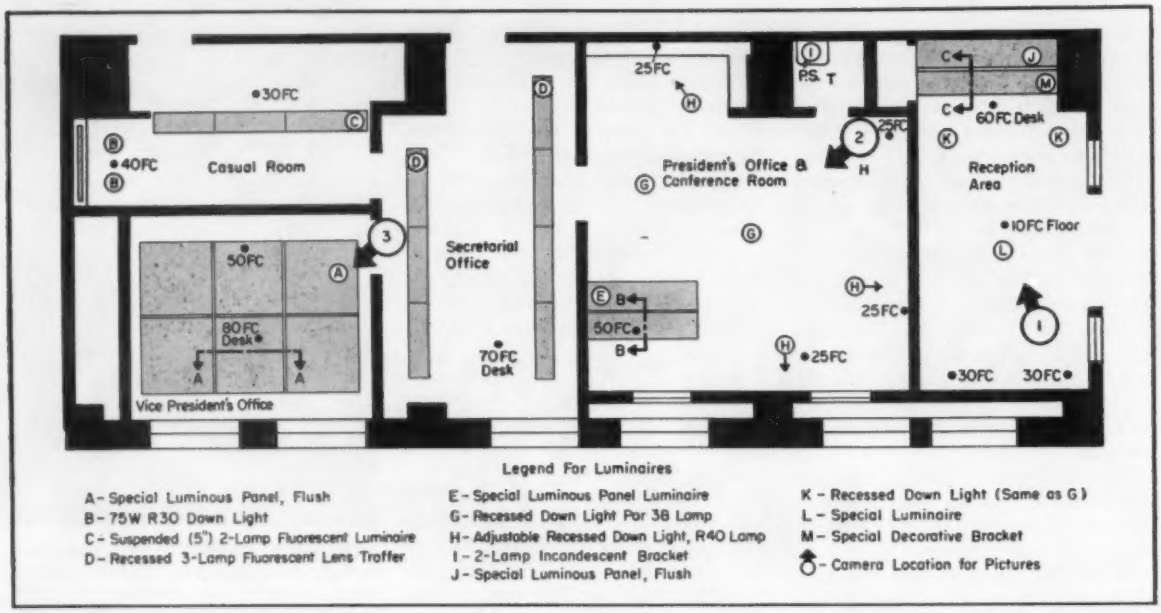
The special fluorescent luminaires, types E and J, were custom designed and custom made by Branham, Mareck, Duepner & Riegert, of St. Louis Park, Minn.

Charles A. Anderson Company supplied the wall bracket (Type M), No. 2253, and the center (Type L) luminaire, No. 6A-80, used in the reception area. The arched diffuser plastic units (Type A) used in the Vice President's office, are Wakefield Theta-Plex units, and the direct-indirect luminaires (Type C) in the casual room are Wakefield Grenadiers, No. GRN-24843.

Troffers (Type D) in the secretarial office are Sunbeam No. H9043-48RS with Holophane controlenses.

Recessed downlights (Types G and K) are Litecraft No. 1500, and (Type H) Litecraft No. 509. The strip light used under the cabinet in the casual room is Garcy No. 8000-48H, and the 75-watt R30 recessed units (Type B) are Litecraft No. 1013.

Kvalsten Electric Company handles all the electrical work in the North-

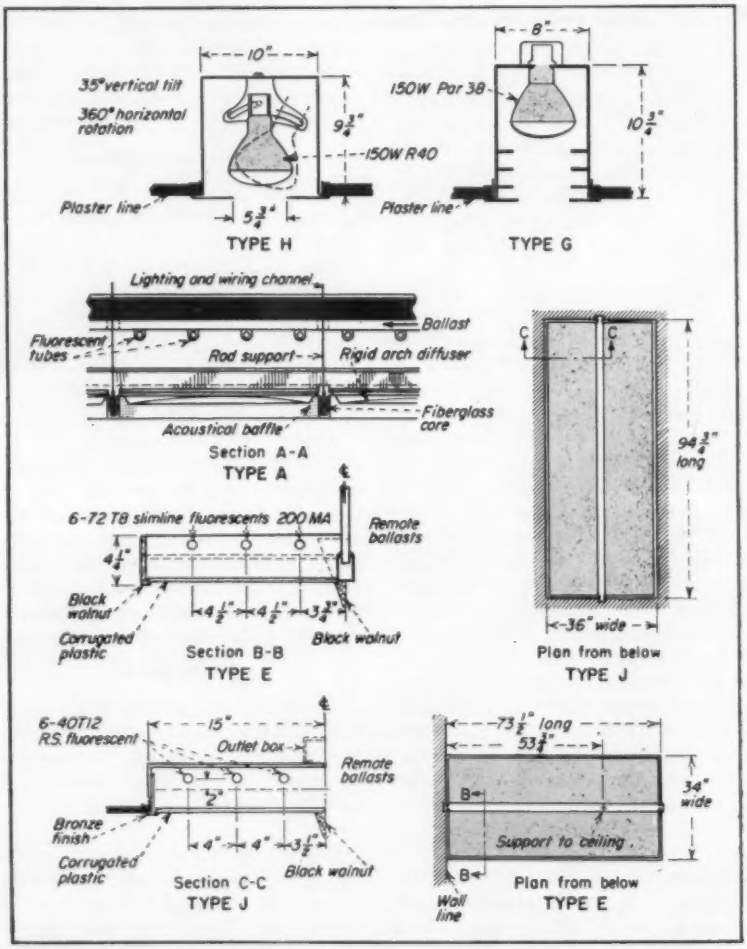


LIGHTING LAYOUT plan for entire suite of offices shows location and types of lighting equipment, and footcandle lighting levels at key locations. Lighting intensities range from 25 to 80 footcandles, as shown on the drawing above.

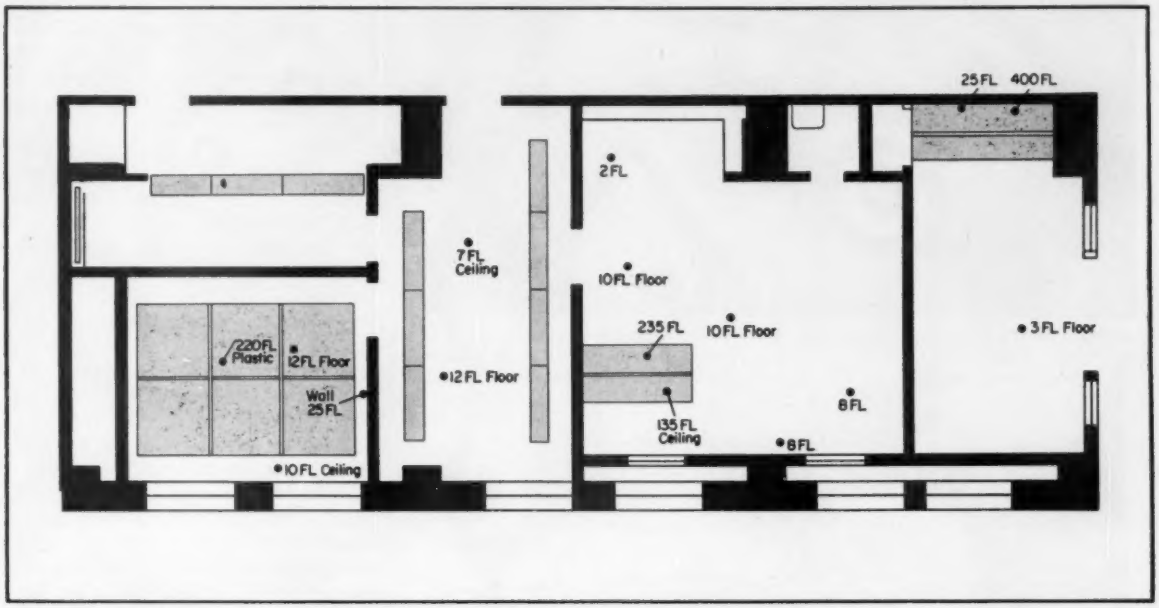
western National Bank building. When additions or remodeling to the building are contemplated, as in this case, Gale Kessler of the building company calls in John O. Kvalsten to assist in the design of the lighting and electrical work when it is still in the planning stage. Thus when the Campbell-Mithun offices were contemplated, Kvalsten was asked for lighting recommendations. Kvalsten and L. E. Johnson, lighting engineer for Northern States Power Company, developed the lighting layout finally approved, working closely with Ray Mithun and his decorator so that lighting equipment details and light patterns would conform and harmonize with the decorative treatments used throughout.

Also assisting with the sale and layout of this lighting installation were various lighting industry people, including: L. J. Riegert, of Branham, Mareck, Duepner & Riegert; H. I. Kenny, Jr., Kenny Sales (Wakefield); and Cyril Barry, Sunbeam Lighting Company, Minneapolis. The lighting equipment was supplied by North Central Electrical Distributing Co., Minneapolis electrical distributors.

Campbell-Mithun, Inc. feels, as do all others concerned with this lighting job, that it is the best office lighting that they have ever seen. It provides adequate levels of illumination where needed, complete freedom from glare and discomfort, and contributes materially to the warm and friendly decorative atmosphere achieved throughout all of the offices.



DETAILS of some of the lighting equipment used to light the Campbell-Mithun offices.



BRIGHTNESS VALUES were carefully planned so that maximum visible brightness would not exceed one candle per square inch, or 452 footlamberts, and so that brightness contrasts would be kept at a minimum in all areas.

LIGHTING COMPETITION

FLOODLIGHTING

WINNER . . . . . **Mahlon Miller**
Electrical Contractor
Phoenixville, Pa.

PROJECT . . . . . **McCausland Motors, Inc.**
Phoenixville, Pa.

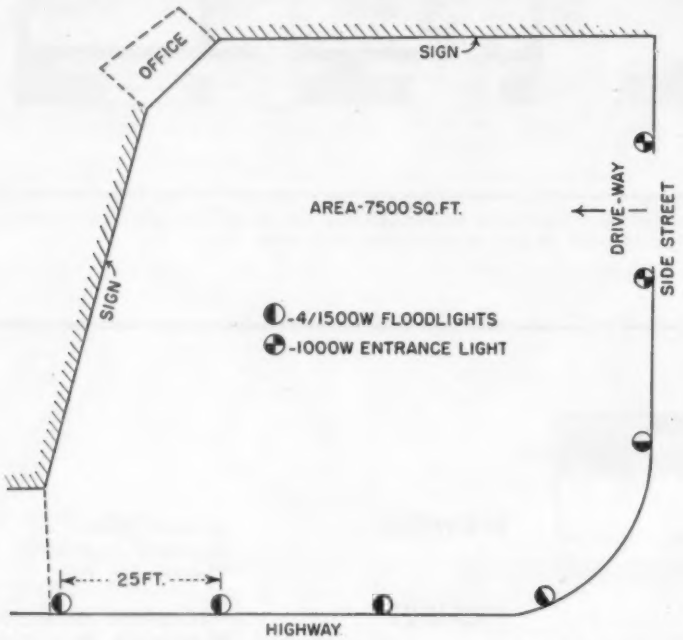
FLOODLIGHTING HELPS SELL USED CARS

A CAREFULLY planned floodlighting system, which projects plenty of light over an entire used car lot, is attracting new customers to the McCausland Motors, Inc. outdoor auto display in Phoenixville, Pa. It also subtly guides visitors into a special parking area provided for them, through appropriate selection and use of different types of lighting units for the drive-in entrance.

The McCausland Motors, Inc. display is on a corner location on a prominent highway, "S" shaped at this point. The problem was to light the 7500 square foot lot so effectively that it would attract the attention of all passersby on the highway. This meant that all lamps must be concealed from view on the highway in both directions, to prevent glare, and that a high lighting intensity should be projected over the entire display area. How well this was accomplished is shown by the accompanying picture and layout.

The lighting system installed consists of 20 No. 5934 Benjamin "Duo Service" floodlights, and two No. N56816 Benjamin "Column-Lite" units, located along the two street sides of the lot. The floodlights were mounted on 35-foot-high poles, four units to a pole, and each equipped with a 1500-watt G-E standard PS-52 lamp. The poles were spaced 25 feet apart. The two "Column-Lite" units were

FLOODLIGHTS project 35 footcandles of illumination over entire used car lot of McCausland Motors, Inc., Phoenixville, Pa., attracts attention of passing motorists on the adjoining highway, makes potential customers of all, buyers of many.



PLOT of used car lot shows location of floodlight poles and drive-in lights, also location of office and the flanking signs.

mounted atop 14-foot-high poles, 20 feet apart, at the drive-in entrance, and each equipped with a 500-watt PS-40 standard lamp. The shovel-like floodlights were selected because of their low cost and light distribution pattern which would project light over the entire lot with spill light outside the lot, or behind the poles on which mounted. Also, the units completely shielded the lamps from the highway to prevent glare, and are easy to maintain—an important factor since the installation will be owner-maintained.

Upon learning that a used car lot was being planned for one of the darkest corners in town, electrical contractor Mahlon Miller contacted William H. McCausland, owner of McCausland Motors, Inc. who was planning for the lot, and suggested a planned lighting system for it. Together they inspected the lighting of all the other used car lots in the entire community, and found that all were woefully underlighted. The best lighted lot had only ten 150-watt PAR-38 reflector lamps in use.

These other used-car-lot owners were also questioned about business. All complained that it was very poor. Some were no longer staying open at night, even though they were located on the extremely busy State Highway, where thousands of potential customers were breezing by constantly.

Upon analysis of these conditions, it didn't take William H. McCausland long to make up his mind. With a first class lighting job, his competition would be practically nil. Light would enable people to see his car displays as they rode by, and would encourage them to stop and investigate. So it took him only a few days to decide he wanted a used car lot with lighting second to none. Mahlon Miller was instructed to proceed with the planned lighting system on this basis.

Working with T. L. Lloyd, retail salesman, and T. H. Gallagher, illuminating engineer, both with Philadelphia Electric Company, Miller worked up the lighting system already described, and proceeded with the installation. It was so designed that it would encourage the potential customers to drive in through a driveway, and to park their cars in back of the cars on display while they were shopping. This kept their cars from in front of the lot, where they would block the view of other passing motorists. This was accomplished by painting the floodlight poles white, and using a large white metal chain between poles; also by using the column-lite units at the driveway entrance. The floodlights are wired and switch-controlled so that either two or four units per pole may be turned on. With all floodlights turned on, the average intensity across the display lot is 35 footcandles. The floodlights were supplied by Philip Cass Co., Philadelphia electrical distributors.

The back side of this lot is provided with a continuous sign. It is mounted above the ground high enough to be seen from the highway over the top of the cars on display, but still low enough to be in evidence at all times to customers on the lot. It was painted with a white background which is brightly lighted by the front-of-lot pole-mounted floodlights, and stands out as an attraction-getter in the distance. It also eliminates from the potential buyers' mind any question of whom they are buying from.

Mahlon Miller reports that his customer is very satisfied with this lighting installation, and that it has attracted many potential customers. Other used car lot owners have made inquiries about lighting their own displays better, as a result of this installation.

Because the floodlights effectively conceal the lamps, the first thing noticed by motorists driving up are the cars on display, and the large sign giving the owner's name. The floodlights themselves are nearly invisible, and do not distract the customer's attention. With sufficient light, the brightly colored cars look clean and sparkle with brilliance, attracting attention from a great distance, and helping the customers to see and appraise the merchandise before they buy.

GOOD LIGHTING aids quality production in the new steel products plant of A. O. Smith Corporation, Leola, Pa., with intensities ranging from 25 footcandles upwards. Ceiling and side walls were finished in light colors.

PRODUCT QUALITY IMPROVED BY

Windowless Plant Lighting

LIGHTING COMPETITION

INDUSTRIAL LIGHTING

WINNER . . . . **John G. Zimmerman**
Zimmerman & Walsh
Quarryville, Pa.

PROJECT . . . . **A. O. Smith Corporation**
Leola, Pa.

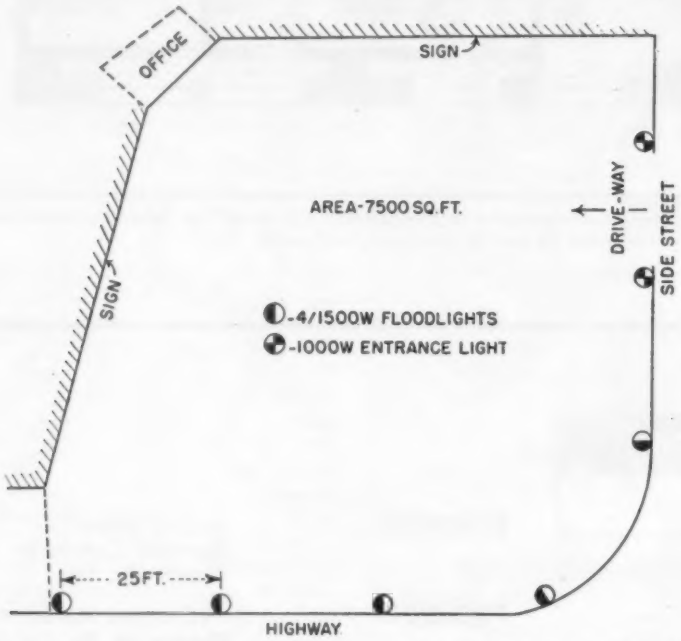
LIGHTING intensities ranging from 25 footcandles minimum to 65 footcandles and above establish new lighting standards in the new windowless factory of the A. O. Smith Corporation, Leola, Pa., for the type of average industrial processing work done in this plant. Embracing an area of approximately 45,000 square feet, quality lighting with an upward component is provided throughout the entire area.

This Leola plant is used by its owners for processing steel products in which chemically compounded materials are added, and involves typical batch mixing, machine operation, and inspection. Quality control is of utmost importance, and this factor dictated the windowless building. Final inspection of the completed products requires extremely high levels of illumination for best results, up to 250 footcandles. Thus the owners specified minimum contrast of lighting levels in adjoining areas to prevent eye fatigue and eye strain of the workers as they pass from one area to another throughout the plant.

General contractors for this new building were the D. S. Warfel Associates. This firm competed with other general contractors by developing the plans for a building which would meet both the needs and the budget of the A. O. Smith Corporation. Electrical contractors Zimmerman & Walsh, of Quarryville, Pa., were called in by Melvin Peters of the general contractor's firm, and asked to design and quote on the lighting and electrical work—an expression of client-to-customer faith based on past satisfactory relationships. Several plans were proposed until one was accepted by the owner, represented by George Graetz, plant manager. The plans finally approved were selected by the owner from a variety of plans submitted by some of the country's largest industrial plant designers and builders.

It was first decided that lighting intensities of 50 to 65 footcandles maintained were necessary for general

FLOODLIGHTS project 35 footcandles of illumination over entire used car lot of McCausland Motors, Inc., Phoenixville, Pa., attracts attention of passing motorists on the adjoining highway, makes potential customers of all, buyers of many.



PLOT of used car lot shows location of floodlight poles and drive-in lights, also location of office and the flanking signs.

mounted atop 14-foot-high poles, 20 feet apart, at the drive-in entrance, and each equipped with a 500-watt PS-40 standard lamp. The shovel-like floodlights were selected because of their low cost and light distribution pattern which would project light over the entire lot with spill light outside the lot, or behind the poles on which mounted. Also, the units completely shielded the lamps from the highway to prevent glare, and are easy to maintain—an important factor since the installation will be owner-maintained.

Upon learning that a used car lot was being planned for one of the darkest corners in town, electrical contractor Mahlon Miller contacted William H. McCausland, owner of McCausland Motors, Inc. who was planning for the lot, and suggested a planned lighting system for it. Together they inspected the lighting of all the other used car lots in the entire community, and found that all were woefully underlighted. The best lighted lot had only ten 150-watt PAR-38 reflector lamps in use.

These other used-car-lot owners were also questioned about business. All complained that it was very poor. Some were no longer staying open at night, even though they were located on the extremely busy State Highway, where thousands of potential customers were breezing by constantly.

Upon analysis of these conditions, it didn't take William H. McCausland long to make up his mind. With a first class lighting job, his competition would be practically nil. Light would enable people to see his car displays as they rode by, and would encourage them to stop and investigate. So it took him only a few days to decide he wanted a used car lot with lighting second to none. Mahlon Miller was instructed to proceed with the planned lighting system on this basis.

Working with T. L. Lloyd, retail salesman, and T. H. Gallagher, illuminating engineer, both with Philadelphia Electric Company, Miller worked up the lighting system already described, and proceeded with the installation. It was so designed that it would encourage the potential customers to drive in through a driveway, and to park their cars in back of the cars on display while they were shopping. This kept their cars from in front of the lot, where they would block the view of other passing motorists. This was accomplished by painting the floodlight poles white, and using a large white metal chain between poles; also by using the column-lite units at the driveway entrance. The floodlights are wired and switch-controlled so that either two or four units per pole may be turned on. With all floodlights turned on, the average intensity across the display lot is 35 footcandles. The floodlights were supplied by Philip Cass Co., Philadelphia electrical distributors.

The back side of this lot is provided with a continuous sign. It is mounted above the ground high enough to be seen from the highway over the top of the cars on display, but still low enough to be in evidence at all times to customers on the lot. It was painted with a white background which is brightly lighted by the front-of-lot pole-mounted floodlights, and stands out as an attraction-getter in the distance. It also eliminates from the potential buyers' mind any question of whom they are buying from.

Mahlon Miller reports that his customer is very satisfied with this lighting installation, and that it has attracted many potential customers. Other used car lot owners have made inquiries about lighting their own displays better, as a result of this installation.

Because the floodlights effectively conceal the lamps, the first thing noticed by motorists driving up are the cars on display, and the large sign giving the owner's name. The floodlights themselves are nearly invisible, and do not distract the customer's attention. With sufficient light, the brightly colored cars look clean and sparkle with brilliance, attracting attention from a great distance, and helping the customers to see and appraise the merchandise before they buy.

GOOD LIGHTING aids quality production in the new steel products plant of A. O. Smith Corporation, Leola, Pa., with intensities ranging from 25 footcandles upwards. Ceiling and side walls were finished in light colors.

PRODUCT QUALITY IMPROVED BY

Windowless Plant Lighting

LIGHTING COMPETITION

INDUSTRIAL LIGHTING

WINNER . . . . **John G. Zimmerman**
Zimmerman & Walsh
Quarryville, Pa.

PROJECT . . . . **A. O. Smith Corporation**
Leola, Pa.

LIGHTING intensities ranging from 25 footcandles minimum to 65 footcandles and above establish new lighting standards in the new windowless factory of the A. O. Smith Corporation, Leola, Pa., for the type of average industrial processing work done in this plant. Embracing an area of approximately 45,000 square feet, quality lighting with an upward component is provided throughout the entire area.

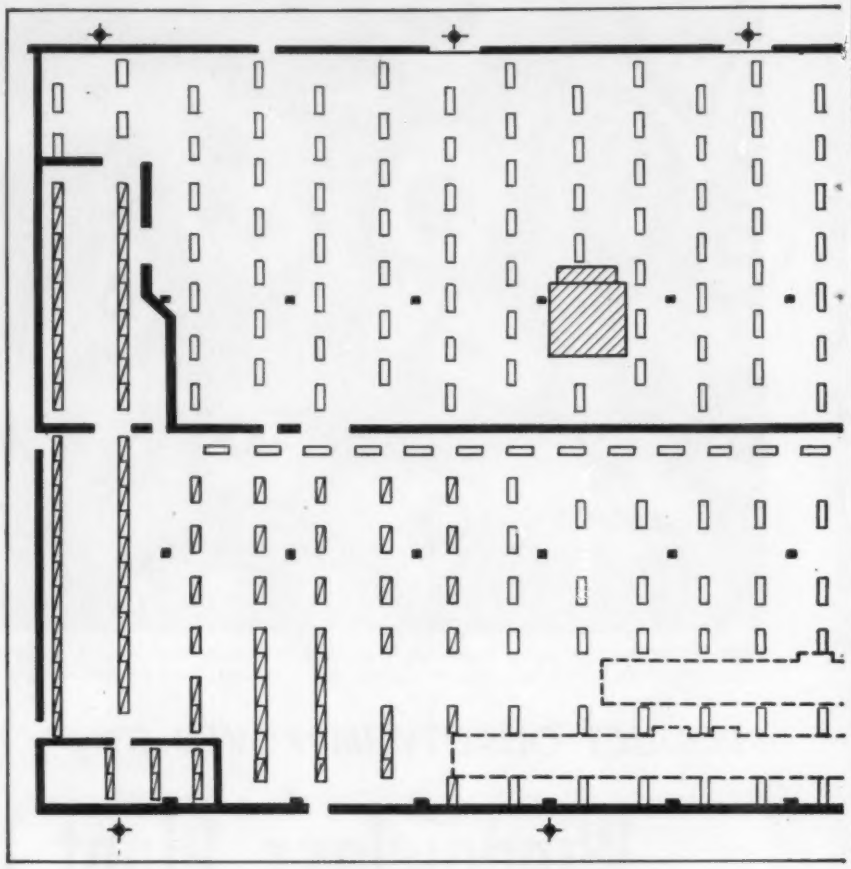
This Leola plant is used by its owners for processing steel products in which chemically compounded materials are added, and involves typical batch mixing, machine operation, and inspection. Quality control is of utmost importance, and this factor dictated the windowless building. Final inspection of the completed products requires extremely high levels of illumination for best results, up to 250 footcandles. Thus the owners specified minimum contrast of lighting levels in adjoining areas to prevent eye fatigue and eye strain of the workers as they pass from one area to another throughout the plant.

General contractors for this new building were the D. S. Warfel Associates. This firm competed with other general contractors by developing the plans for a building which would meet both the needs and the budget of the A. O. Smith Corporation. Electrical contractors Zimmerman & Walsh, of Quarryville, Pa., were called in by Melvin Peters of the general contractor's firm, and asked to design and quote on the lighting and electrical work—an expression of client-to-customer faith based on past satisfactory relationships. Several plans were proposed until one was accepted by the owner, represented by George Graetz, plant manager. The plans finally approved were selected by the owner from a variety of plans submitted by some of the country's largest industrial plant designers and builders.

It was first decided that lighting intensities of 50 to 65 footcandles maintained were necessary for general

lighting in areas adjoining critical inspection points, where the owners specified the 250-footcandle level. Once these levels had been determined, Zimmerman & Walsh recommended that the entire plant, which is nearly 400 feet long, be lighted in a manner that would make it appear to be evenly lighted from one end to the other. To obtain this condition, it was necessary to set a minimum of 25 footcandles maintained even over storage areas where normally an intensity of from five to ten footcandles is usually considered adequate. Then standard spacings for luminaires were established, and the number of lamps per luminaire were used as a variable to obtain the required variable lighting intensities for the different areas.

Interior lighting consists entirely of industrial fluorescent luminaires, using 40-watt rapid start lamps. These luminaires were provided with slotted-top porcelain enameled reflectors which allow an upward component of approximately 20%. At the request of John G. Zimmerman, the ceiling was finished a light cream color having a reflectance of about 80%. This eliminated excessive contrast between the lighted reflectors and the overhead ceiling when looking upward or along the length of the building. It also helped smooth out the illumination level throughout the building.



Over 700 reflector units were required to light this plant. These are DayBrite units, No. RS-40281 for 2/40-watt lamps, and No. RS-40381 for 3/40-watt lamps. A uniform suspension of 14 feet above the floor was adopted, leaving about four feet clearance to the ceiling. Spacing between rows was set at 10 feet, and spacing between units in the same row was varied for different intensities.

All fluorescent lamps used are Sylvania 40-watt cool white rapid start type. Fluorescent lamps were selected as the light source because they were considered highly practical for producing such high levels of illumination. The standard cool white color was selected because it was considered the best color for the quality inspection standards used in this plant.

As in most cases, cost was the most important single problem with which Zimmerman & Walsh had to contend. Accordingly, they used a thinwall conduit grid wiring system with Crouse Hinds SEHC cast outlet boxes located eight feet on centers, and attached to the bottom of the roof purlins, to provide electrical service to the lighting.

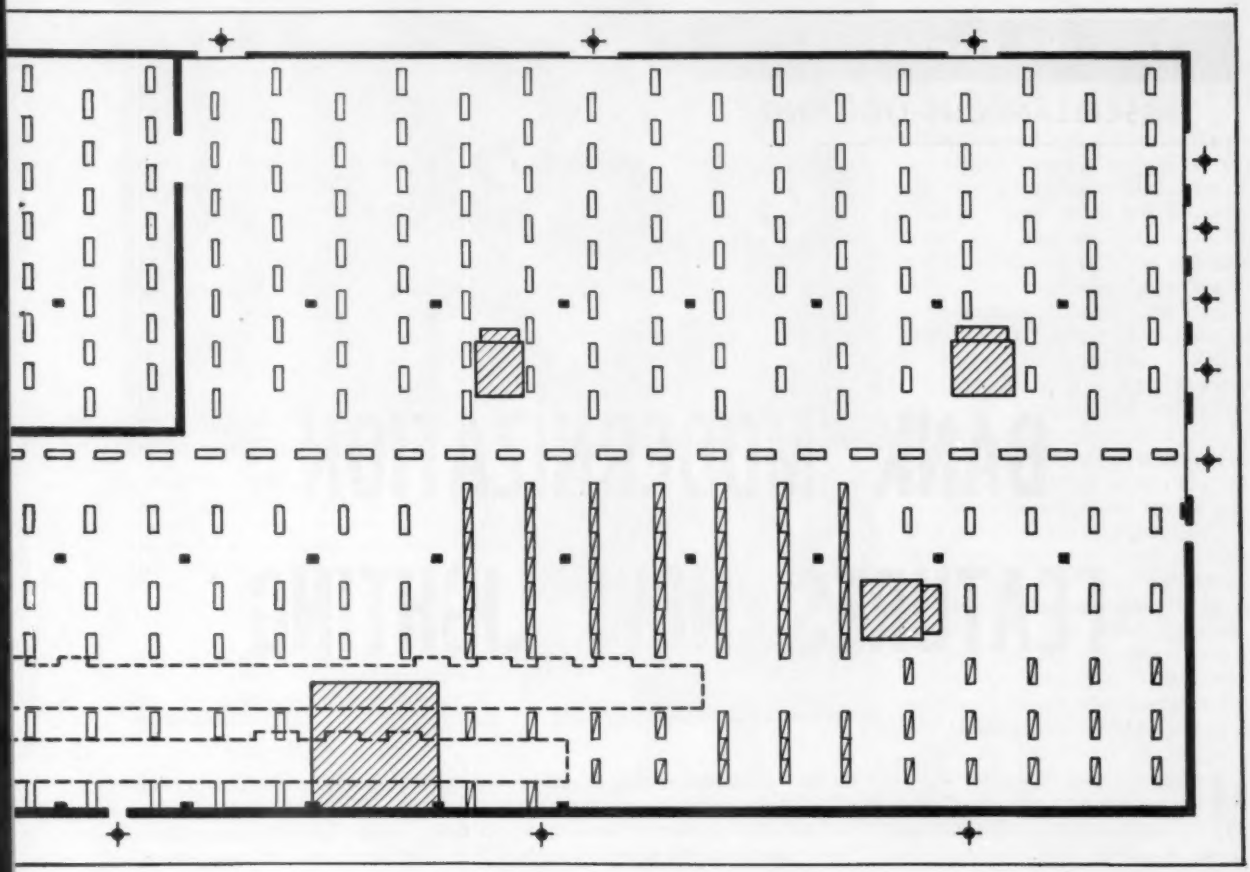
The exterior of this plant is lighted by 11 Holophane No. U-850 Refractolens units, each equipped with a 1000-watt standard incandescent lamp, and by five 150-watt standard RLM units over doorways at one end of the building.

Although this plant is completely windowless, a sufficiently high level and quality of evenly distributed light has been obtained that practically none of the workers are conscious of the absence of daylight. The employees were recruited mainly from a predominantly rural area. It was essential therefore that these workers should not feel shut in after being accustomed to outside work. It is remarkable that during the entire first year this plant has been in operation not a single employee has complained about the lack of windows.

All lighting and electrical materials were supplied by Rumsey Electric Company, Philadelphia electrical distributors. Their salesman, William C. Dages, cooperated in the sale of this job through prompt quotations and expediting of the order. The lighting layout was prepared by John G. Zimmerman, and the design checked by Norman Hartman, lighting engineer with Pennsylvania Power & Light Company, electric utility furnishing power to the plant, who also cooperated in the sale of the job.

An unexpected bonus was realized by the owners of the new plant when the quality of the finished product was found to run much higher consistently than in other similar plants operated by this same firm. Management and skilled workmen undoubtedly contribute greatly to this new standard of quality; however, the unusually high levels of illumination permit workers to be more accurate than has previously been thought possible.

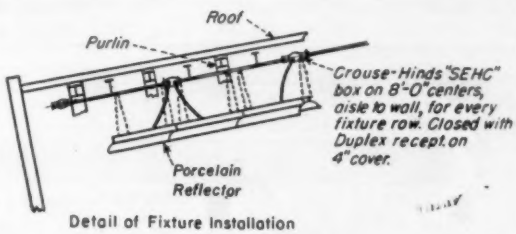
This lighting installation is neither novel nor precedent setting, in the opinion of John G. Zimmerman, but it is considered outstanding by him because it embodies, without compromise, the highest standards required for average industrial processing work of this type. The installation is composed of standard lighting components installed in strictly conventional methods. The results alone are unusual, he says, because of the excellent eye comfort seeing provided for the workers, and because of improvement in quality of work as shown by the firm's production charts.



Legend:—

- 2-Lamp Daybrite porcelain reflector units
- 3-Lamp Daybrite porcelain reflector units
- No. U-850 Holophane 1,000-watt refractolens

LIGHTING LAYOUT shows variable spacings used throughout the 45,000 sq. ft. area to provide specific intensities for different processing operations. All units are mounted 14 feet above the floor, in rows spaced ten feet apart. Variable spacings between units in each row and number of lamps per luminaire were used to provide the variable intensities.


Roof
Purlin
Crouse-Hinds "SEHC" box on 8'-0" centers, aisle to wall, for every fixture row. Closed with Duplex receptacle and 4" cover.
Porcelain Reflector

Detail of Fixture Installation

LUMINAIRES are industrial fluorescent type, installed in staggered layout, and have slots on top to permit 20% upward component which lights ceiling softly and reduces contrast.

WIRING for lighting system was done in thinwall conduit grid to cast outlet boxes 8-feet on centers along each row of units. Luminaires are chain-suspended four feet from ceiling.

LIGHTING COMPETITION

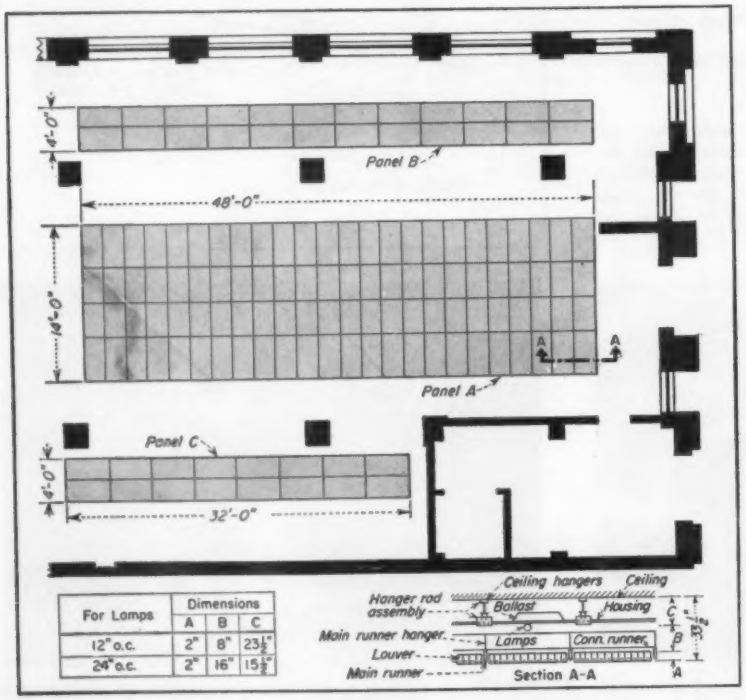
MISCELLANEOUS LIGHTING

WINNER... **Ellsworth C. Harper, Jr., Partner**
Sanford Electric Company,
Sanford, Fla.

PROJECT... **Sanford Atlantic National Bank**
Sanford, Fla.

BANK MODERNIZATION FEATURES NEW LIGHTING

MODERN new lighting was a major feature of the remodeling of the Sanford Atlantic National Bank, Sanford, Fla., completed recently. The new lighting consists of large luminous panels recessed flush in the new suspended ceiling, of surface-mounted fluorescent luminaires, and of recessed incandescent reflector lamps. The large luminous panels provide a high level of completely diffused light over the main floor of the bank. The standard two-lamp shielded luminaires light the office work areas, and the reflector lamps flood the vault door and similar area with an abundance of light.



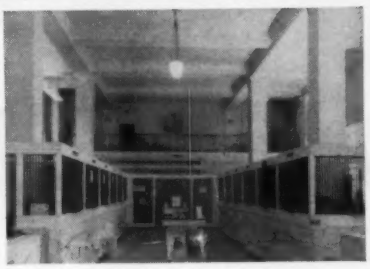
LIGHTING LAYOUT plan of ceiling shows size and location of large-area low-brightness louver panels over main banking area.

Before remodeling, this bank had a high beamed ceiling, and tellers, cashiers, etc., worked behind typical old-style bank screens, or cages. Lighting was poor, with one old style ornamental incandescent luminaire hanging in the center of the main public area, and nine enclosing globe suspended units equipped with 200-watt lamps lighting work areas behind the bank screen and in offices. So not only was the lighting unsatisfactory, but also the bank's fixtures and furnishings were outmoded.

Modernization was done on a direct approach basis. The bases of the old style bank screens were retained, but the jail-like bars of the superstructure were removed and discarded, and replaced by a modern low rail of wood and glass. A suspended ceiling was installed 35 inches overall below the old existing ceiling, which served to conceal the ceiling beams of the original job, and air conditioning ducts which were installed for a new air conditioning system; also to provide a support, with necessary plenum space, for the large area louver panels and fluorescent lamps and housings required for the new lighting system.

Three large luminous panels were

LARGE PANELS of 45-degree cut-off louvers provide comfortable high level illumination and modern decorative treatment to the newly remodeled Sanford Atlantic National Bank, Sanford, Fla.



OLD INTERIOR of bank presented modernization and lighting problem, including ceiling beams, and obsolete high screen around tellers' cages.

used to light the bank proper, as shown in the lighting layout plan. Panel A is 14 feet wide by 48 feet long, and is located over the center of the bank's main public area. It contains 48 louver sections each 24 inches wide by 48 inches long, and 48 louver sections each 24 inches wide by 36 inches long, arranged as shown in the layout plan and the picture of the completed job. Installed 16 inches above the louvers are a system of 24 96T12 fluorescent lamps and 24 72T12 fluorescent lamps, supported in lamp housings. One 96-inch and one 72-inch lamp are used end-to-end to extend across the 14-foot panel width, and these 14-foot long rows of two lamps per row are spaced 24 inches apart; that is, centered over the four 24-inch louver sections across the 14-foot width.

Panel B is also 48 feet long, but only four feet wide. It has 24 panel sections, each 24 inches wide by 48 inches long, arranged in pairs with panel sections installed end-to-end. Installed above this louver panel are 24 96T12 fluorescent lamps, with the lamps only 8 inches above the top side of the louver sections. The lamps are installed in four continuous rows along the length of the panel, and are 12 inches apart. Panel C is four feet wide and 32 feet long, with four sets of four 96T12 lamps mounted end-to-end on the same spacings and height above louvers as in Panel B.

The plenum above each of the three large panels is painted flat white, with a reflectance of about 80%, so that by interflection as well as direct radiation a maximum amount of the light emitted by the lamps is directed and reflected through the louver openings to the banking area below.

Louvers are of steel, finished in baked white enamel, and are of egg-crate design with cell openings 2 inches square by 2 inches deep. This provides 45-degree shielding of lamps and plenum space both lengthwise and crosswise of the louvers. By painting this plenum white, the reflected light is highly diffused and lights the louvers uniformly so that they take on a low brightness evenly lighted appearance simulating that of a uniform diffusing medium such as opal glass or white plastic, and this aids in spreading the light widely and uniformly over the entire area in the bank below.

The louver panels and housings are Smithcraft Lighting Division's "Area Illumination" lighting units. The panels were installed in areas between the heavy beam members running between columns, and by using panels of varying dimensions, to conform to the floor areas below, a modern design element was achieved which gives the bank an effectively modern atmosphere.

Office working areas at the rear of the main banking floor were lighted with surface-mounted Smithcraft units on the ceiling. These were 2-lamp No. FED2-96430 fluorescent luminaires with 45 by 45-degree louver shielding.

Cool white General Electric fluorescent slimline lamps were used throughout. One major factor in the selection of this "color" of white fluorescent lamp was that its spectral quality would blend well with the abundance of daylight which also filters into this bank through its large high windows. The lamps all operate from two-lamp high power factor ballasts at 430 ma.

Light utilization is high because of the light finishes and colors used throughout the bank interior. The acoustic tile ceiling is white, with a reflectance of about 75%. The walls are sea-foam green, and have a reflection factor of approximately 50%. The floor and low partitions are white marble, with an average reflectance of 50-60%; and the furniture is mahogany. The vault is stainless steel.

The lighting intensity averages about 40 footcandles maintained in service in the main banking area under the louver panel lighting. It averages about 75 footcandles in the offices.

The total electrical load is 11,000 watts, and the area is 3000 square feet of main banking area, and 1500 square feet of office work area.

Ellsworth C. Harper, Jr., partner in the electrical contracting firm of Sanford Electric Company took the initiative in selling this lighting to the bank and architect, before the plans and specifications were drawn. After talking with R. J. Bauman, president, and R. F. Mann, vice president, of the bank, he called upon Ken H. Hill, local Smithcraft representative, and his father, senior partner with him in the Sanford Electric Company, for help in selling the bank's officials and Board of Directors. Elton J. Moughton, architect in charge of design for remodeling, also aided in selling this modern lighting system to the bank's officers, because of its modern design appearance and high efficiency.

Others cooperating in the design and sale of this lighting installation included Kenneth C. Cooper, consulting engineer, who designed and specified the lighting and electrical systems; Tally Joiner, Graybar Electric Company salesman of Orlando, Fla., who helped by pricing the equipment and by expediting delivery after the order was placed; and by F. A. Dyson, general contractor, who cooperated with Sanford Electric Company in the installation of this new and modern lighting installation.

LIGHTING COMPETITION

STORE LIGHTING

WINNER ... **Milton W. Stratton, Vice President, Independent Wiring Company, Philadelphia, Pa.**

PROJECT ... **Paul F. Klinefelter, Inc. Decorative Fabrics Philadelphia, Pa.**

INCANDESCENT LIGHTING

THE harmonious blending and matching of fine fabrics, wall papers, and other decorators' products has been aided and greatly improved at Paul F. Klinefelter, Inc's. display rooms in Philadelphia, Pa. This has been brought about through the installation of a louvered direct-lighting type of incandescent lighting system throughout the 1650 square foot store. This system was carefully selected and expertly designed to put plenty of light of good color quality on the merchandise displays, and at the same time to keep the lighting equipment as inconspicuous as possible.

This decorative fabric house was previously located on an upper floor of the same building. The old location was lighted in a generally unsatisfactory manner. It had eight unshielded type fluorescent luminaires, each equipped with four 40-watt lamps, which were suspended from the ceiling on stem hangers. This lighting was inadequate in quantity, glaring, of poor color quality which was unsatisfactory for matching or comparing colors, and the luminaires did not harmonize with and complement the store interior.

The new display rooms occupy a first floor area which was converted into an attractive and effective sales area through relighting and repainting. Building and structural changes were kept to a minimum by selecting a lighting system which could be integrated into the existing and proposed structural and decorative treatment of this interior. This required that the new lighting equipment be surface mounted on the existing ceiling, and that the wiring be run exposed.

In designing this new lighting system the objectives were several. First, it was decided to benefit from the lighting experiences gained in the old location, and to provide a system for the new area which would eliminate most or all of the faults of the old system. To accomplish this it was decided the new lighting system should make it possible for customers to see the beautiful fabrics and fine merchandise easily, to determine design, pattern, and color quickly and positively, and to match or blend one color fabric with another satisfactorily. Also, the new lighting system should blend harmoniously with the architectural design and plan of the new store location.

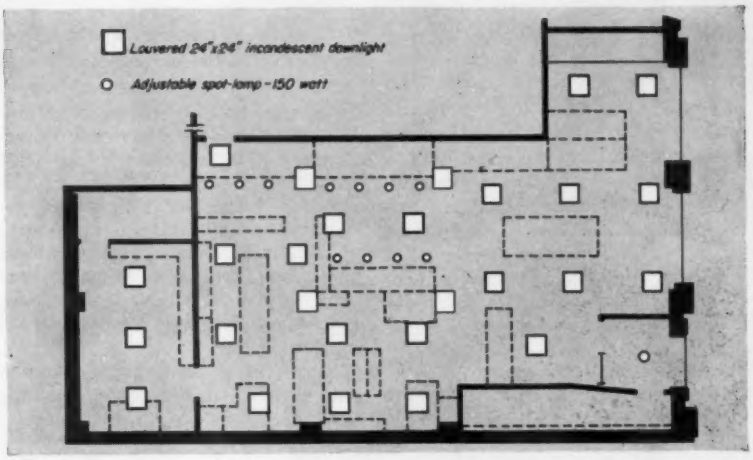
Further, it was decided to make the new lighting system as inconspicuous as possible. It was decided that incandescent light sources would provide the best color quality for the type of merchandise displayed and sold in this store. For one thing, there seemed to be a wider choice of luminaire designs with character and individuality, with good light control, and with modern appearance, for use with incandescent lamps. Also, incandescent lamps provided the color quality of light which showed the merchandise in the same color as the customers are generally experienced and accustomed to seeing such fabrics.

A louvered direct lighting system was selected, which combines two types of lighting units. There are 23 Silvray "Skylike" units, and 11 Swivelier units in the system. The Silvray units are No. SM 50F/300 Skylike units, each 24-in. by 24-in. square, by 8-in. deep, equipped with egg-crate louver bottom for shielding, for use with a 300 watt silvered bowl lamp. The Swivelier units are No. B-81 adjustable type reflector lamp units, each equipped with louvers for shielding, and for use with PAR-38 150-watt reflector spot or flood lamps.

All lighting equipment is surface mounted on the low 9-ft. 10-in. ceiling. Wiring was done in exposed Wiremold, including extra electrical capacity which had to be provided. Flexible switching was also provided so that variable lighting effects could be had. The luminaires are all located in relation to fixed merchandise displays. The sides of all luminaires were painted the same color as the ceiling so that it is difficult to see that they are surface mounted. The visible part of the units has a smart, modern appearance.

General lighting is provided by the 300-watt silvered-bowl units which diffuse a soft light over a wide area. These units were selected because their louvers provide excellent shielding, both of the reflector interior and of the

PLAN LAYOUT shows luminaires located functionally with respect to merchandise displays, providing maximum lighting efficiency and best conditions for easy inspection.



DIRECT LIGHTING system puts emphasis on merchandise, while ceiling is kept dark and unobtrusive.

HELPS SELL FABRICS

INCANDESCENT LAMPS in modern luminaires effectively light the fine fabric display rooms of Paul F. Klinefelter, Inc., Philadelphia, Pa., and were used to provide the color of light under which the fabrics are normally seen.

lamp, they are very modern in appearance, and they collect dirt and dust slowly so that less maintenance will be required. They can also be relamped easily, by simply unscrewing the the burned-out lamp and screwing in a new one. Louvers and other parts do not have to be disturbed. Also, they were easy to install, and required no cutting of ceiling or housing.

Punch lighting on displays is provided by the reflector lamp units, and their adjustable mounting permits flexible control of the beam direction, plus varying lighting effects.

Emphasis is placed on the merchandise through the use of the direct lighting, plus the careful selection of reflection factors of finishes on store interior surfaces. The ceiling is finished in a chocolate brown having a 6% reflectance. The walls are a rose beige with 50% reflectance. The carpet is also rose beige, but with a 30% reflectance, and all furniture is gray with a 30% reflectance. This treatment gives the ceiling a darkened appearance, as may be noticed in the photographs, with the main emphasis on the lighted displays.

The general level of illumination varies from 30 to 40 footcandles on the horizontal across the room. Average intensity on vertical displays is also about 40 footcandles, but feature displays may be highlighted to higher intensities by the reflector lamp units.

Because of the low reflectance of the ceiling finish used, the lighter finishes of the merchandise and display backgrounds stand out in sharp contrast with the ceiling. Thus it was not necessary to provide unusually high levels of illumination on the merchandise displays to obtain a high contrast with the ceiling. The desirable attraction value to the merchandise was possible with lower lighting intensities, more nearly in line with intensities which are found in the homes of the customers. The lighting system is therefore efficient in the job it does, even though it requires a minimum of lighting equipment.

This lighting installation was promoted by Milton W. Stratton, vice president and engineer of Independent Wiring Company, electrical contractors who sold and installed the lighting equipment and did the electrical work. Mr. Stratton had ample opportunity through the years to observe the merchandising methods being used by this fabric house, one of his regular customers for electrical work. Thus when the owner of the store decided to move to the first floor of the same building, Mr. Stratton suggested that a modern lighting installation be considered. The owner showed interest, so Mr. Stratton contacted George T. Anderson, Jr., illuminating engineer for the Philadelphia Electric Company, and together they presented the story of planned lighting, including a tailored-to-function lighting layout, which the owner accepted.

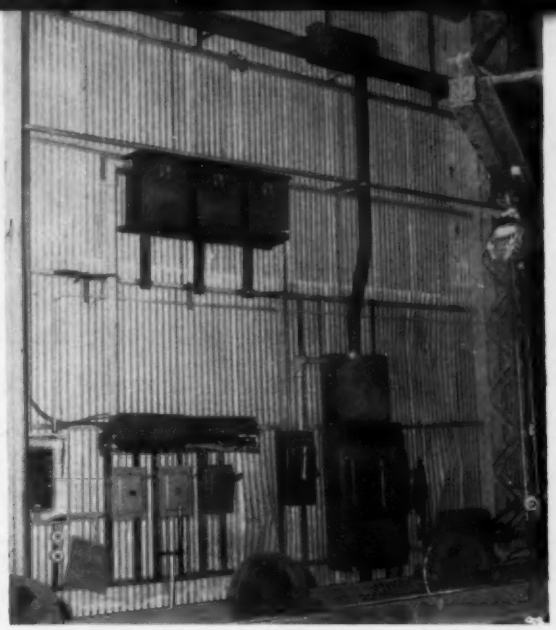
The lighting equipment for this installation was supplied by Sylvan Electric Fixture Company, Philadelphia electrical distributors. General Electric lamps were used throughout.

In commenting on the results of the completed installation, Mr. Stratton points out that the installation is completely satisfactory, and that his client has complimented him highly on the success of the job. "From a practical standpoint", he says, "the merchandise is adequately lighted with a good color quality of well diffused light so that the displays stand out prominently and helps make buying a pleasure. Also, the lighting system blends well esthetically with the entire sales interior, and the luminaires appear to be recessed flush in the overhead ceiling. Lighting levels vary, adding interest, and customers are not overpowered by a mass of lighting equipment and brilliance overhead to detract from the display of the merchandise."

DISPLAYS are uniformly lighted from floor to ceiling by wide light distribution of the louvered lighting units.

REFLECTOR LAMP units project high intensity of light on vertical drapery display for quick and easy inspection by customers.

TRANSFORMER BANK 4 (Location A in plot plan) consists of three 100-kva 3-phase transformers, connected for 13.2kv primary and 440-volt secondary. Transformer output feeds through conduit riser (arrow), down underground to power center in fabrication area. Transformer bank 3 consists of three 167-kva units, 13,200/440 volts; bank 2, of three 37½-kva units, 13,200/120-208 volts. Banks 2 and 3 feed sections of the plant through underground conduit; bank 1 feeds power underground and into the adjoining office building.

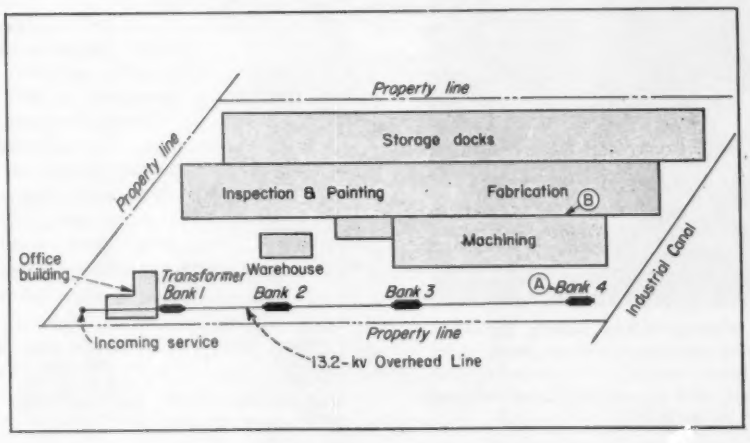


POWER CENTER in the fabrication area (Location B) contains: main disconnect switch (right) for feed from transformer bank 4; three 10-kva lighting transformers for stepping 440-volt, 3-phase power to 120-208 volts 3-phase; and disconnects for 120-208 volt feeders. Power to main switch comes up from underground and is fed in conduit to plug-in busway which runs around the area, high up on the wall. Tap-off through switch at immediate left of main switch supplies lighting transformers. All equipment shown is mounted on bar stock supports welded in frames and secured to structural steel. Six 25kva transformers, 440/120-208 volts, are used elsewhere in plant. High bay lighting uses 750-watt, R-52 lamps on horizontal parts of roof trusses.

Power For Steel Fabrication

High voltage distribution is the backbone of complete modernized electrification for steel fabrication at the plant of Orleans Materials and Equipment Co., on the Industrial Canal, New Orleans, La.

By Frank Prattini, *Manager, Brignac Electric Co., New Orleans, La.*



PLOT PLAN of plant shows layout of transformer banks used for high voltage distribution. Service from utility is 13,200 volts, 3-phase, 3-wire, from a single pole in corner of plant property. Electric energy is metered at this pole. All transformer banks feed underground from their secondary sides to areas they serve. Plant is divided into three bays, each 75 ft wide and 800 ft long. Two bays have two overhead cranes in each; other bay has one crane. Total horsepower of plant is 950 hp. From left to right in the diagram, the plant is divided into three sections, each section fed by one transformer bank. Circled letters correspond to accompanying photos.

ELECTRIC HEATING . . . *THE TREND IS*

With improved equipment, installation techniques and technical data available, electric heating is constantly growing in efficiency, economy and public acceptance. Here are some practical suggestions for promoting, designing, selecting, installing and operating this modern means for obtaining complete winter comfort.

CONDUCTIVE RUBBER, sealed between layers of insulating paper, constitutes a uniform radiant heating surface. Thin sheets covered by aluminum foil or panels backed by asbestos board may be obtained in a number of sizes for either 230- or 115-volt operation.

BEAMED CEILINGS are ideal for framing ceiling heating panels or radiant sheets, as indicated by this attractive kitchen-dining area. Operating at 230 volts, this installation requires a minimum number of circuits, can use smaller wire sizes, control equipment and overload protection. Temperature regulation is automatic.

ELECTRIC heating — constantly growing in acceptance and scope —opens up a vast new field of endeavor for electrical contractors. This we know as a positive fact because, since World War II, our own activities in this field have justified the formation of a separate heating division in our several-sided electrical contracting organization. This trend to electric heating is naturally gratifying. It is also logical—for the variety of applicable heating equipment is constantly expanding, efficiencies of products are on the rise, installation techniques are improving, and reliable design data are becoming available in ever-increasing volume.*

Public appreciation for electric heating is likewise spreading, because economic margins related to conventional fuels are rapidly lessening while tangible benefits of electric heating are becoming ever stronger selling points. Just to mention a few; these points include (1) instant heat with no time lag, (2) unrestricted wall and floor space in rooms, (3) no fuel storage, (4) no ducts or chimneys, therefore no transmission losses, (5) automatic zone control for obtaining uniform temperatures, (6) natural humidity, (7) noiseless operation, (8) no fumes or dust, (9) maximum cleanliness, (10) low maintenance costs, plus a high order of (11) safety and (12) efficiency. Collectively, these many definite advantages constitute a hard-

*Such as in EC&M: Apr., Aug., Oct. and Nov., 1949; Jan. and July of '50; July of '51; Mar. and June of '52; Mar. and May of '53; Sept. and Nov. of '54.

UPWARDS

By Mario J. Lamperti,
President, North Bay Electric Works, Inc.
San Rafael, California.
Licensed EE and ME, State of Cal.

THIN ALUMINIZED SHEETS are secured to the ceiling by means of an adhesive. Circuit connections are made to small terminal blocks on the front of one edge (see arrows), then wiring is enclosed by narrow, unobtrusive metal molding. Sheets may be finished with a flat paint to harmonize with surroundings.

hitting, hard-to-resist promotional pitch.

As a result of these plus values, contractors have the opportunity to develop a market having terrific potential, yet they have the conjunctional responsibility for broadening their own technical know-how and methods. This is essential, for no single product can possibly satisfy all heating requirements and—if specific results are to be guaranteed under a variety of conditions and situations—it is necessary to have a thorough across-the-board understanding of heating theory, design problems, heating mediums, control methods and installation techniques. Only by utilizing this knowledge and equipment in varying combinations can a contractor obtain exact results, satisfy his customers and, at the same time, justify his participation in this field of service.

Putting this fundamental theory into practice, our own heating engineer has assembled a comprehensive reference library, has studied manufacturers' literature, examined and tested numerous products, inspected jobs during construction to check up on field problems and installation details, and has discussed in-service performance with many of our customers in order to better evaluate long-term operation of equipment. The result has been his development of a practical, working understanding of such heating mediums as conductive rubber panels, insulated resistance cables, various types of in-built wall units, radiant baseboards, convection heaters, radiant glass panels, electric steam radiators and so on. Since these several products vary in basic cost, amount of installational labor, pattern of heat distribution, characteristics of heat emission, surface temperature, method of control and recommended location, we can offer a customer a liberal choice of prices, methods and performance guarantees.

Selection of Mediums

Occasionally we combine several methods or products in a single installation, such as resistance cables in concrete slabs for some areas; radiant ceiling panels, wall units or suspended apparatus for others.

When this is done, it is for definite reasons. For example; we have found that a heated slab has considerable residual heat (similar to the characteristics of a hot water system) and it is comparatively economical to install and operate. However, it is not always feasible or desirable to install the necessary slab (especially on upper floors) in which to bury the cables and, unless the operation of the system is completely automatic, there is a definite possibility for fluctuations in temperature. In other words, if a person manually pushes the thermostat up high when he feels cool or pushes it down low when he feels too warm, by the time the air temperature rises or falls sufficiently to satisfy his comfort, the temperature of the slab has passed that point by a considerable margin and it is too late to prevent a temperature surge in the opposite direction. The only way to prevent this surging from taking place is to set the thermostat at the desired level, then leave it alone completely.

Conversely; ceiling panels have fast pick-up, they provide close regulation of temperatures within a critical range, they do not require a slab, can be installed in old as well as new construction, provide even diffusion of heat and give blanket coverage of floor areas.

Wall panels and recessed units also have definite advantages, for they are simple and fast to install, they provide fast, high heat output for small areas, and they may be used either singly to augment inadequacies of an existing system or as the instruments for an entire self-sufficient installation. These wall units are particularly applicable for bathrooms or similar areas because, through their use, it then becomes possible to remove the local chill without warming up an entire house or large area. Surface temperatures related to these units are high, however, and the area of coverage is less extensive than that obtained with other heating means.

But regardless of the heating means selected, separate circuits and thermostatic controls are recommended for each room, area or application. This provides maximum convenience, efficiency, flexibility and comfort. This is particularly important in residences where, encouragingly, over 80% of all electric heating systems have this feature.

Design Procedure

The purpose of any type of heating system, naturally, is to create and maintain a comfortable atmosphere within a structure throughout the winter months. And, since the required capacity of a system depends upon the (1) cubical volume or exterior surfaces of the room or building, (2) the difference between indoor and

LEAD-SHEATHED RESISTANCE CABLE is laid on top of a rough sub-base of concrete, being placed in straight, serpentine or zig-zag lines, depending upon the length of wire required to give uniform coverage and ample heating capacity. Finishing coat of cement is placed on top of the installation, trowelled smooth.

CIRCUIT WIRING serving slab-contained radiant heating cables is color-coded Number 12 TW, while thermostatic controls may operate at either line voltage or low voltage with relays. Radiant floor systems are economical to operate and, considering residual heating characteristics and automatic regulation, temperatures may be held constant.

ASPHALT MASTIC coating is placed both beneath and on top of resistance cable to prevent chemical reaction between lead sheath of wire and alkali contained in the cement. Non-heating lead wires are brought together at central points, then connected to common branch feeders that run in conduit through the base slab to circuit junction boxes.

outdoor temperatures and (3) the type of insulation and construction involved, these three factors are determined as our first step. After determining the heating requirements in this manner, we calculate the wattage requirements, then consider specific architectural and installation problems, layout or arrangement of the heating elements, method of control and, finally, the appearance of the completed job.

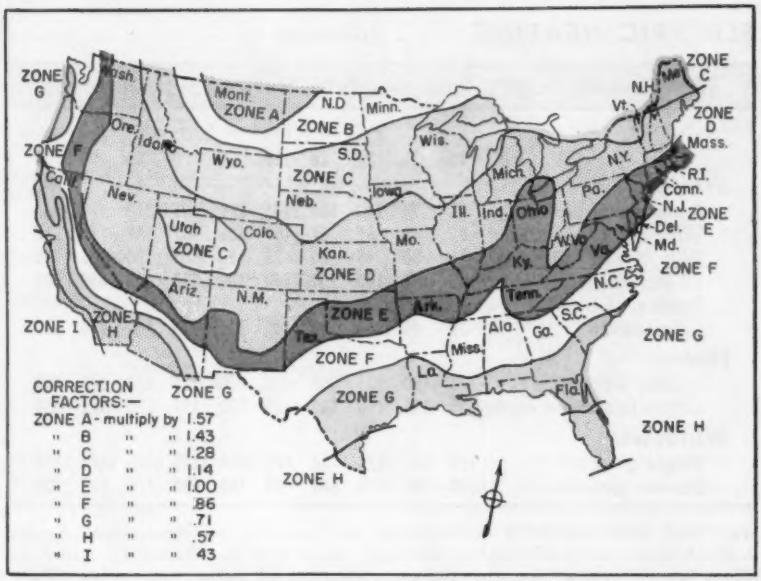
With reference to the three preliminary steps just mentioned; the cubical volume, floor plans, amount of glass area and the like can be accurately ascertained from blueprints or, if they do not exist, by making actual job site measurements. Using dimensions to the nearest foot is sufficiently accurate.

Next we consider transmission factors for different types of construction; such as for wooden frame, masonry or brick walls; single-glazed windows or storm sash; thickness and type of insulation and so on. Then, to obtain total heat transmission through these various materials, the coefficients are multiplied by the respective areas and by the designed-for temperature differential; that is, for the difference between desired indoor maximum and contemplated outdoor minimums. Indoor maximums are generally taken around 70 degrees, and outdoor minimums are usually considered to be 15 degrees above the lowest temperature ever recorded in the area. Since outdoor temperatures drop below this design point only occasionally, its selection constitutes an acceptable compromise between installation economy and complete adequacy on the coldest days. This apparent lack of coverage, however, may be offset by increasing the final estimated heating demand to take care of normal morning pick-up, normal infiltration and ventilation, and for abnormal intermittent temperature extremes.

Transmission factors for various types of construction may be obtained from a number of sources, such as the American Society of Heating and Ventilating Engineers' annual Guide, the FHA, manufacturers of electric heating products, trade magazines (see EC&M, Nov. '54) and the like. Some of the factors are presented as Btu values, others are converted into direct "watts per square foot" of material.

For faster reference, these various values can be worked up into tables (an abbreviated part of one being herewith shown as Table I), so that multiplication or the use of a slide rule is reduced to a minimum during the stages of computation.

For example; Table I has been developed for an outside design temperature of 20 degrees, and it lists watts per sq ft needed to compensate for the loss of heat transmitted through several types of flooring, walls, windows and doors. These wattage requirements have been listed for 10, 20, 30 sq ft, etc., so that total wattage may be quickly ascertained by breaking any figure into components, then adding or subtracting the indicated wattage subtotals. To illustrate, a room having 192 sq ft of exterior frame construction with 2 inches of commercial insulation would require 300 watts for 200 sq ft (20 times 10), less 12 watts for 8 sq ft (one-tenth of 80). The answer is quickly found to be 288 watts. Although Table I is worked up for a 20-degree outside design temperature, it may be adapted to higher or lower temperatures by correcting the values by 10% for each 5 degree variation in design temperature. That is, if the design temperature (for the example just stated) had been zero instead of 20 degrees, the requirements would have been 288 times 1.4 or 403 watts.

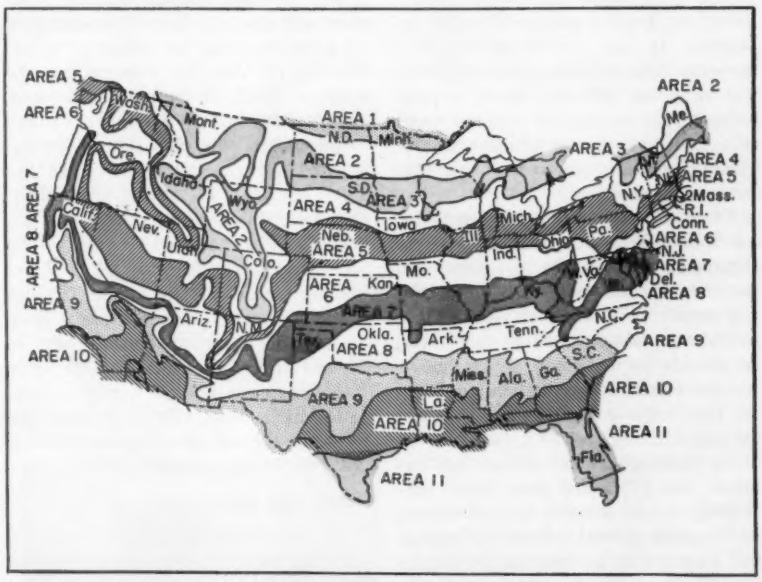


CAPACITY OF HEATING EQUIPMENT, in wattage, is dependent upon outside design temperatures, which are taken as 15 degrees above lowest temperatures recorded for any particular area. Normal winter conditions in the U. S. are assumed to occur in Zone E, although wattage requirements for other zones may be obtained by multiplying with indicated factors.

Short Cut for Normal Conditions

For speeding up heating calculations when conditions are normal or average, these various intermediate steps have been combined into one simplified table (Table II), so that requirements in "wattage per cubic foot" can be ascertained in one single operation. Based upon data compiled by the Federal Housing Administration, this table assumes normal conditions of operation, normal exposure, normal glass areas and normal winter conditions. Normal winter conditions consider an outdoor minimum design temperature of zero (existent in Zone E of Map I) and values for colder or warmer climates may be obtained by multiplying the figures of Table II by the indicated correction factors.

Since the table applies only to normal conditions, it is not applicable where rooms are smaller than 100 or larger than 400 sq ft in floor area, or where glass and door areas exceed 25% of the total wall surfaces. In those cases the longer procedure must be followed for accuracy. Table II is not applicable for estimating basement heating requirements, because basement walls and floors in contact with the ground are normally well above the freezing zone, there is generally a certain amount of heat being transmitted to basements by water heaters or upper rooms in the house, and glass areas in basement rooms is minimum.



ANNUAL COST FOR ELECTRIC HEATING depends not only on outside temperatures but on duration of the heating season as well. Yearly power consumption in kilowatt-hours closely follows the degree-day curves for the country and may be obtained by multiplying installed capacity of heating system (in watts) by 1.88 for area 1; 1.51 for area 4; 1.18 for area 7; 0.61 for area 10, etc. (see text).

Since the average contractor generally serves a limited territory, he need not work up tables for many different design temperatures, but can compile "rule of thumb" factors to satisfy the type of construction and weather experienced in his particular section of the country. Once these factors have been computed and verified through checks on actual performance experiences, subsequent paper work may be greatly reduced.

By referring to the table, it will be noted that the importance of insulation should not be minimized, for proper insulation results in greatly increased personal comfort, reduced heating requirements, correspondingly lower operating charges, reduced drafts and generally improved health conditions.

TABLE I — Wattage Requirements for Various Surface Areas

	Square Feet of Surface									
	10	20	30	40	50	60	70	80	90	100
Walls:										
Frame, uninsulated	47	93	140	186	233	279	325	372	419	465
With 1-inch insulation	22	43	65	87	109	130	152	174	195	217
With 2-inch insulaton	15	30	45	60	75	90	105	120	135	150
12-inch brick and plaster	50	100	150	200	250	300	350	400	450	500
Same plus blanket insulation	20	40	60	80	100	120	140	160	180	200
Floors:										
Double wood	75	150	225	300	375	450	525	600	675	750
Concrete slab on earth	65	130	195	260	325	390	455	520	585	650
Windows:										
Single glass	175	350	525	700	875	1050	1225	1400	1575	1750
Double glazed	90	180	270	360	450	540	630	720	810	900

WATTAGE REQUIREMENTS in this table are true only for areas where outside design temperature is 20 degrees, although values may be adjusted by adding or subtracting 10 percent for each 5-degree variation in design temperature. Table takes into account normal infiltration and ventilation. Use of table may be extended by adding other types of construction as they are encountered by the design engineer.

TABLE II — Wattage Requirements per Cubic Foot

Construction Key	Exposed Walls 1	2	3	4
A C G E G	1.7	2.4	3.3	3.8
A C G F G	1.5	1.9	2.5	2.8
A C H F G	1.3	1.6	2.0	2.2
A C H F H	.9	1.2	1.6	1.8
B C G E G	2.0	2.8	3.9	4.8
B C G F G	1.7	2.3	3.2	3.7
B C H F G	1.3	1.6	2.0	2.2
B C H F H	.9	1.2	1.6	1.8
A D G E G	1.4	2.2	3.2	3.9
A D G F G	1.1	1.7	2.5	2.9
A D H F G	.9	1.4	1.9	2.3
A D H F J	.9	1.3	1.8	2.1
B D G E G	1.7	2.6	3.9	4.7
B D G F G	1.4	2.1	3.1	3.8
B D H F G	.9	1.4	1.9	2.3
B D H F J	.9	1.3	1.8	2.1

Key: A — Wooden frame construction.
B — Masonry walls (cinder block, solid brick, concrete, etc.)
C — Wooden floor with basement or enclosed crawl space beneath.
D — Concrete floor slab on ground.
E — Single-thickness glass in windows and doors.
F — Storm sash or double-glazed windows and doors.
G — No additional insulation.
H — 2 inches of commercial insulation (mineral or vegetable fiber).
J — 1 inch of commercial insulation along edge of concrete slab.

Notes: This table applies only to rooms over 100 and under 400 sq. ft. in area. It does not apply to rooms where glass and door areas exceed 25 percent of wall surface. It does not apply to basement rooms. It is assumed that 4 inches of commercial insulation will be installed on top-floor ceilings. For areas of the country other than Zone E (on Map I), above requirements should be multiplied by 1.57 (Zone A), 1.43 (Zone B), 1.28 (Zone C), 1.14 (Zone D), .86 (Zone F), .71 (Zone G), .57 (Zone H), .43 (Zone I).

SHORT CUT METHOD for estimating wattage requirements of a room is applicable when all conditions are "average". Total wattage requirements of heating installation are obtained by matching construction features with lettered Construction Key in the table, then multiplying wattage factor by the cube of the room.

Aside from these advantages which affect the heating picture directly, insulation is also recommended as a fire-retarding medium, a sound-proofing or noise-reducing agent, a plus-value for increasing the property value of a structure, and an additive for obtaining greater comfort during hot summer months.

Once the wattage requirements for all rooms in a structure have been figured by either of the just-mentioned methods, the number of required ceiling panels, wall units, or feet of slab-contained radiant heating cables can be quickly ascertained. Then, knowing the extent of heating equipment to be installed, a layout of equipment can be prepared.

In locating ceiling panels, for example, we (1) place them fairly uniformly around a room to obtain even distribution of heat. However, panels are placed (2) as near as practically possible to exposed walls in order to counteract normal infiltration, and we also give thought to (3) forming a panel pattern which will be attractive as well as utilitarian.

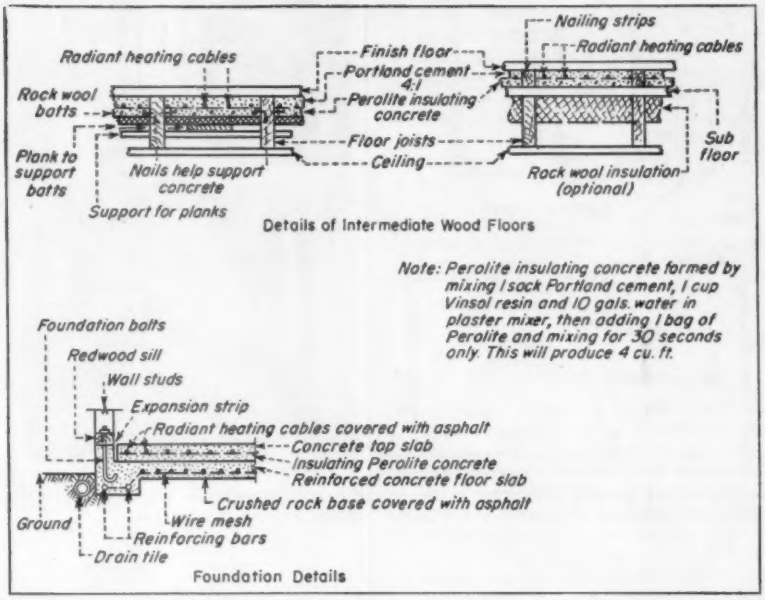
Annual heating costs naturally depend upon many variables, such as the duration and severity of cold weather, local utility rates, the amount of insulation in a building, type of construction, percentage of glass areas and the temperatures maintained indoors. This level depends upon personal choice, varying considerably at times from the recommended level of 70 degrees.

For average approximations, however, the annual kilowatt consumption of a building can be estimated by referring to Map II, determining the area in which the building is located, then multiplying the building's wattage requirements by the proper factor. Factors for the respective areas are (1) 1.88, (2) 1.71, (3) 1.61, (4) 1.51, (5) 1.48, (6) 1.25, (7) 1.18, (8) .92, (9) .77, (10) .61 and (11) .34. To illustrate; a residence in Area 7 requiring the installation of 10,000 watts of ceiling panel heating would have an annual electrical consumption of around 11,800 kilowatts (10,000 times 1.18) during a normal winter season. If the local utility rate is 2½ cents per kilowatt, the estimated annual heating cost would approximate $295.

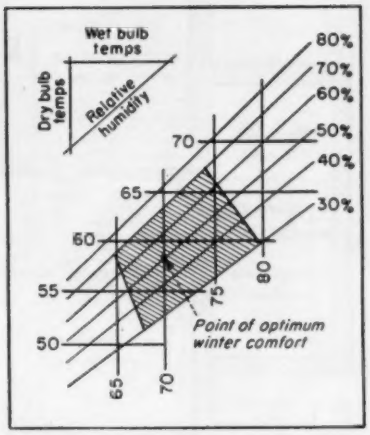
Panels and Slabs

As mentioned earlier, we have a working knowledge of many different types of heating mediums and have installed all of them at various times, either to obtain specific results, meet various construction problems or to satisfy the preferences of customers. However, for comprehensive space heating, the bulk of our installations have been designed around either Uskon electrically conducive rubber sheets mounted on ceilings, or around insulated resistance cables buried in concrete floor slabs.

The sheets we use are Type T; thin (1/8 inch) and lightweight (1 lb/sq ft), obtainable in several sizes (3-by-4, 4-by-4 or 6-by-4 ft) and applicable


Nailing strips
Radiant heating cables
Finish floor
Radiant heating cables
Portland cement 4:1
Rock wool batts
Perolite insulating concrete
Floor joists
Sub floor
Plank to support batts
Ceiling
Nails help support concrete
Rock wool insulation (optional)
Support for planks
Details of Intermediate Wood Floors
Note: Perolite insulating concrete formed by mixing 1 sack Portland cement, 1 cup Vinsol resin and 10 gals. water in plaster mixer, then adding 1 bag of Perolite and mixing for 30 seconds only. This will produce 4 cu. ft.
Foundation bolts
Redwood sill
Wall studs
Expansion strip
Radiant heating cables covered with asphalt
Concrete top slab
Insulating Perolite concrete
Reinforced concrete floor slab
Crushed rock base covered with asphalt
Ground
Wire mesh
Reinforcing bars
Drain tile
Foundation Details

RADIANT HEATING CABLES are placed on top of lightweight Perolite insulating concrete slab, then are covered by Portland cement layer. Cables are protected by coating of asphalt. When used to heat ground floor, this construction is supported by reinforced concrete slab poured directly on crushed rock base. When used for upper floors, Perolite slab is supported either by subfloor or by rock wool batts and planks.



COMFORT CHART indicates that optimum winter indoor conditions exist for most people when mildly circulating air with a relative humidity of 50 percent is at a dry-bulb temperature of 71 degrees. Tests prove, however, that personal preferences for indoor temperatures vary between 65 and 79 degrees, depending upon conjunctional humidity conditions.

for either 115- or 230-volt operation. Sheets come equipped with two small terminal blocks attached to one 4-foot edge on the room side, and sheets are wired in parallel, using 19-strand No. 12 TW wire and standard Code-approved methods of installation. Metal raceways of small cross section are used as molding around the room, covering the terminal blocks and enclosing all circuit wiring at the same time. For maximum flexibility of operation, a separate thermostatic control is recommended for each room, and the load on any one circuit is limited to 20 amps. In the average residence, this limit generally permits two rooms to be carried on each circuit, grouped as living-dining area, kitchen-bath, bedroom-bedroom, etc.

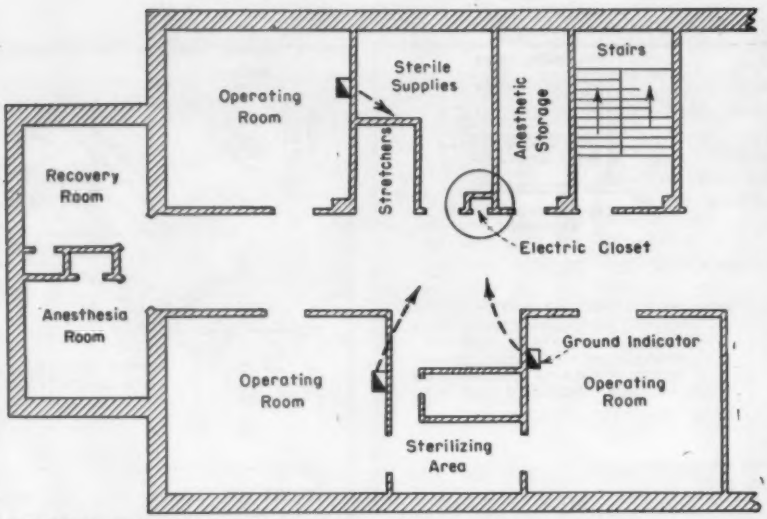
Sheets may be applied directly to plaster, plaster board or any other smooth ceiling surface with an adhesive binder, then are generally painted with a flat paint to harmonize with the interior of the structure. Sheets are spaced uniformly around the ceiling in a simple pattern, thereby providing uniform heat over the entire area of the room while maintaining a pleasing decorative effect at the same time.

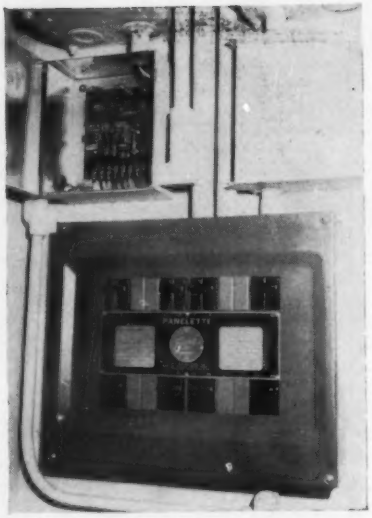
With sheets placed on the ceiling in this manner, maximum radiant benefits are obtained although, for rooms with unusually high ceilings, the sheets may be installed on walls instead. This shifts the emphasis from radiant to convection heating, but efficiency is raised by bringing the sheets closer to the normal zone of sensible comfort.

When installing slab-contained heating cables we generally use lead-sheathed resistance wire, laying it in a zig-zag pattern on a rough base slab to obtain the necessary coverage. These wires rest upon and are covered with a coating of asphalt mastic, which prevents lead sheath corrosion due to the action of alkali in the concrete. All cables in each room are laid so that their non-heating terminal leads are in close proximity to each other. These leads are then connected to a common branch feeder which is run through a slab-contained conduit to the circuit junction point. To complete the installation, a finishing coat of cement is applied over the cables, trowelled to a smooth surface or (optionally) surfaced with rubber tiling or hardwood flooring as a final installation step.

PRACTICAL DESIGN of any heating installation requires basic knowledge of heating theory, available heating mediums, potential installation problems, mathematics and drafting ability, as here indicated by ASHVE Guide, manufacturers' literature, sample of conductive rubber radiant sheet with terminal block and molding, T-square, slide rule and layout plan.

In summarizing, we have found that the satisfaction of those having electric heating systems is complete for, although we have a standing offer to rectify or remove any inadequate or unsatisfactory installation (without cost to our customers), we have never yet been called upon to swallow that unconditional guarantee. We definitely believe that electric heating is here to stay. And, with intelligent promotion and public education, the potential market can be as wide as tomorrow's horizon.





SURGICAL WINGS of hospital include audible-visual ground indicators in operating rooms. Associated equipment including circuit breaker panels, relays and transformers is mounted in electric closet (right) outside the hazardous area.

Operation of

ISOLATED GROUND SYSTEM

in surgical wing of St. Clare's Hospital, Denville, N. J. Installation by Edward J. White Co. of Newark is typical of ground-detection circuits designed to guard against explosions in anesthetizing locations.

THE ground-detecting system of St. Clare's Hospital in Denville, N. J., provides an opportunity to study the operation of one method of fulfilling National Electrical Code requirements for such an installation.

The system was installed by Edward J. White Co., electrical contractors of Newark, N. J. It reduces to a minimum the danger of electric shocks or explosions in the operating or delivery rooms which could occur due to arcs or sparks in the event of wiring insulation failure.

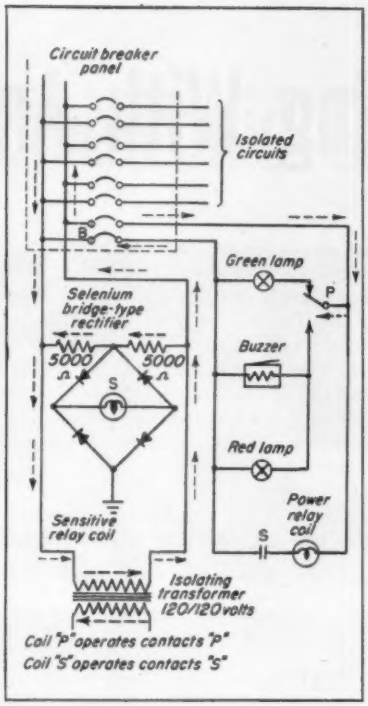
To provide advance warning of such danger, sensitive Wheelock ground-detecting units were installed. These detectors monitor all circuits serving locations where combustible anesthetic agents are used. A leakage current of as little as 2 milliamperes to ground is enough to operate the built-in red warning light and buzzer.

To permit operation of such detectors, none of the branch circuits servicing the lighting fixtures and receptacles of the hazardous areas has the usual permanently grounded conductor. Instead, a 120/120-volt, dry-type, 1-to-1-ratio isolating transformer feeds the circuits. A grounded metallic barrier between the windings of the transformer prevents leakage of current or an actual fault between the primary and secondary turns. Thus there is no metallic connection between these hazardous-area circuits and the main feeder or other circuits in the building having grounded conductors.

Control equipment, isolating transformers and branch circuit panels are mounted in an electric closet outside the hazardous area. Breaker handles are interlocked to insure simultaneous opening of both conductors of each circuit.

Detector Operation

Signal lights and buzzer are mounted in a small panel recessed into the wall of the operating room about 8 feet from the floor. These signals are energized through breakers "B" in the branch circuit panel (see Fig. 1). A green light signifies normal operation, with no ground anywhere on the system. Fig. 1 shows the flow of current from the isolating transformer through the green signal light and back to the transformer during one-half cycle.

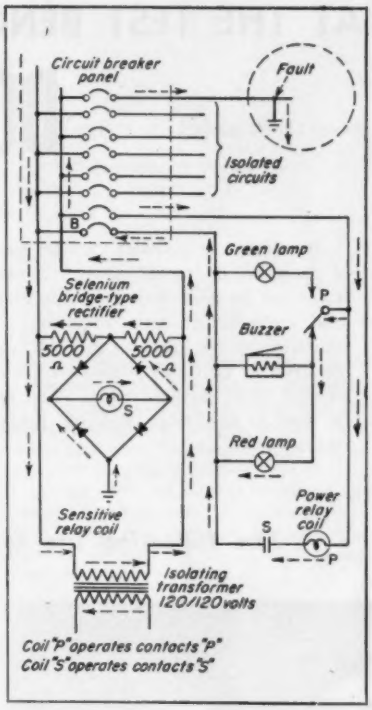


◀ **Fig. 1: NORMAL OPERATION**

- Arrows show current path during one half of ac cycle
- Line current flows through 5000-ohm resistors but not through rectifier, since no circuit exists to ground.
- Green light receives current through power relay contact "P", which is in its normal position.
- Red light and buzzer are out of circuit.
- Two-pole breaker "B" in panelboard affords overcurrent protection and provides means of making visual and audible signals inoperative.

Fig. 2: ACCIDENTAL GROUND ▶

- A ground anywhere on the isolated system (shown here within dotted circle) will cause current to flow through the bridge rectifier circuit.
- Current through sensitive relay coil "S" closes contact "S." (Selenium disc rectifier elements are arranged to permit current to flow through this coil in same direction during both halves of ac cycle.)
- This energizes power relay coil "P," connecting red warning light and buzzer across line through contact "P."



Should a ground occur anywhere on the system, such as that shown within the dotted circle in Fig. 2, a path for the ground current is completed through a selenium bridge-type rectifier circuit. This rectifier and associated relays are located on a panel in the electric closet.

The bridge current flows through a sensitive relay "S", closing contacts "S". This provides a path for the current through the power relay coil "P". Contact "P" is operated by this coil, thus disconnecting the green lamp and connecting the red warning lamp and buzzer. Since the bridge-type rectifier circuit permits current to flow through coil "S" always in the same direction, the coil remains energized and the combined visual and audible signals continue until the fault is corrected or the breaker "B" is opened. Immediate measures to locate and remove the ground must be taken.

The 5,000-ohm resistors in the rectifier circuit serve as a voltage divider which limits the ground current in accordance with NEC provisions. Requirements for installations of this type are covered by Section 5135 of the National Electrical Code and by Paragraph 5-5 of the National Board of Fire Underwriters Pamphlet No 56 dated July, 1952.

SUMMARY OF NEC REQUIREMENTS

CIRCUITS WITHIN ANESTHETIZING LOCATIONS

- shall be ungrounded and supplied from an ungrounded distribution system which is isolated from other distribution systems by means of one or more transformers having no electrical connection between primary and secondary windings.
- shall be controlled by a switch having a disconnecting pole in each conductor.
- shall operate at not more than 300 volts between conductors.
- shall have an approved overcurrent device of proper rating in each conductor.
- shall be provided with an approved ground contact indicator.

CIRCUITS SUPPLYING ISOLATING TRANSFORMERS

- shall operate at not more than 300 volts between conductors.
- shall be provided with proper overcurrent protection.

ISOLATING TRANSFORMERS AND OVERCURRENT DEVICES

- shall be installed in non-hazardous locations.

GROUND CONTACT INDICATOR

- shall respond if any conductor of the system becomes grounded.
- shall limit the leakage current to 2 ma should any conductor become grounded.
- shall contain a green signal lamp conspicuously visible to personnel in the anesthetizing location which shall remain lighted as long as no ground exists.
- shall contain adjacent to the green lamp a red signal lamp and an audible alarm signal which will be energized should any ground occur on the system.
- shall not be installed within a hazardous area.
- should be tested at least weekly for proper operation by successively grounding each conductor of the system through a suitable meter or resistor.

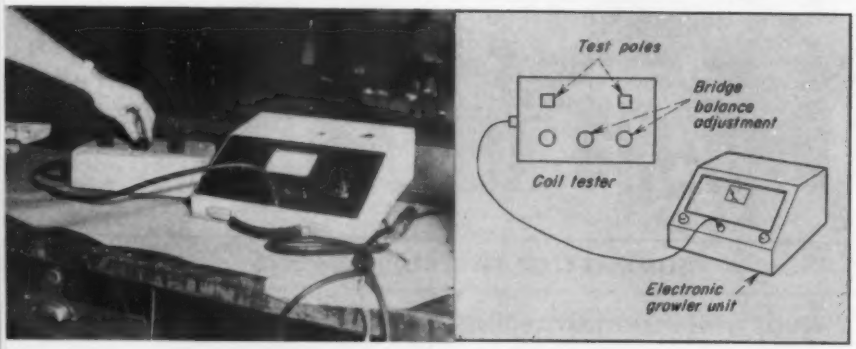
AT THE TEST BENCH- - - - 9

DC Motor Testing With An

An electronic growler can be used for a wide range of tests on dc motor parts. A special accessory coil tester can be used with the basic growler unit for testing field coils before iron mounting. Essentially a very sensitive bridge circuit, this accessory unit plugs into the growler unit and provides tests for open circuits and shorted turns in field coils. The arrangement can also be used to test relay, holding, magnet, transformer and similar coils.

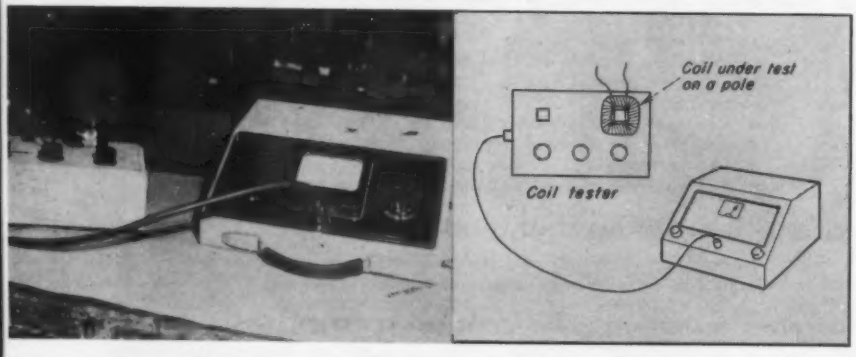
When a coil under test is placed over one pole of the accessory unit, the existence of even a single shorted turn of wire will immediately produce deflection of the meter on the growler. The coil is permeated with an 800 cycle magnetic field; induced currents resulting from shorted turns upset the balance of the bridge. The degree of unbalance is amplified in the growler unit and then indicated on the meter. Comparison coils are not required, and no connections of coil leads are necessary.

The following are typical tests which can be made on dc motor equipment:



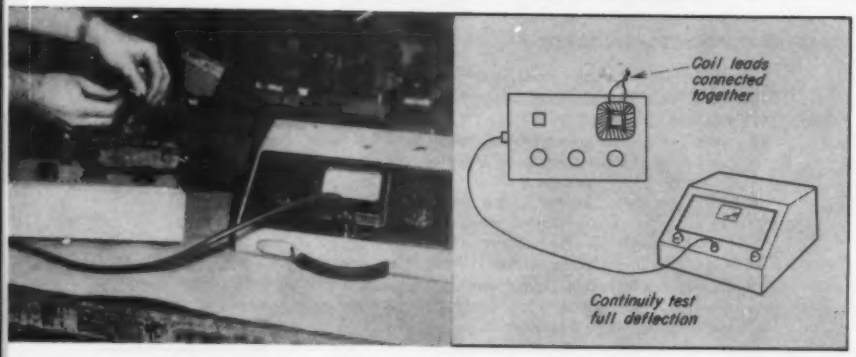
TEST 1.

Adjusting the growler and accessory unit for use. The cord from the accessory coil tester plugs into the receptacle in the center of the front panel of the growler unit. The bridge circuit of the coil tester is then adjusted for zero deflection of the meter on the growler by varying resistance and capacitance in the variable leg of the bridge. Zero adjustment is made by means of knobs on the top of the accessory unit.



TEST 2.

Testing a coil for shorts. Here, a coil with its leads free of contact with each other is placed on one of the poles on top of the coil tester unit. Presence of a short within the coil—a short of even only one turn—will be clearly indicated by deflection of the meter pointer on the growler unit.



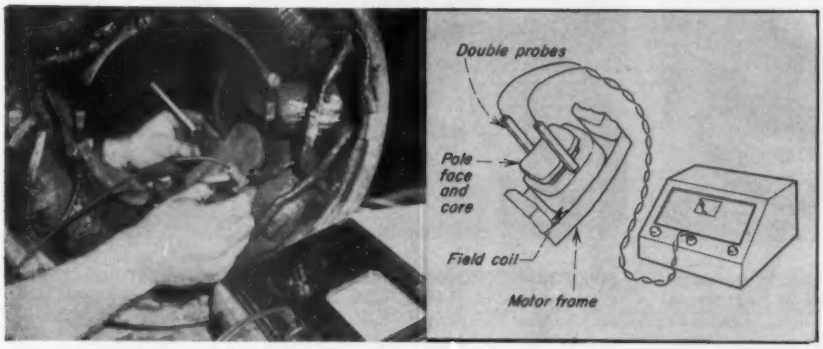
TEST 3.

Checking continuity of a larger coil. In this test, the coil is placed over one of the poles on the coil tester and its leads are connected together. If the circuit of conductor turns making up the coil is not broken—if there is continuity of the coil—full deflection of the meter pointer will result. Presence of an open will be indicated by no deflection at all.

Electronic Growler

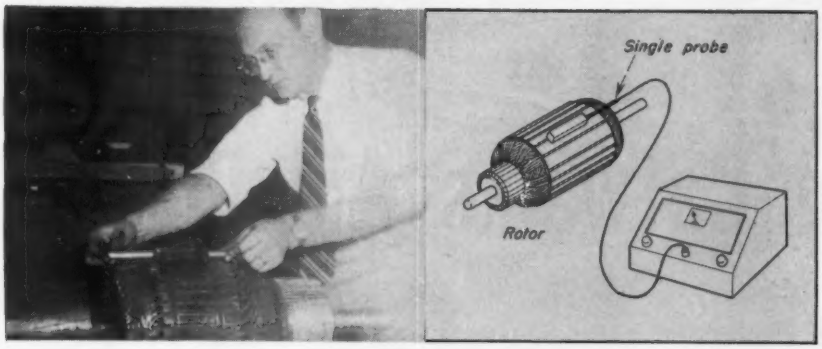
By Walter J. Prise, *Chief Engineer*

Queens Electric Motors, Inc.
Jamaica, N. Y.



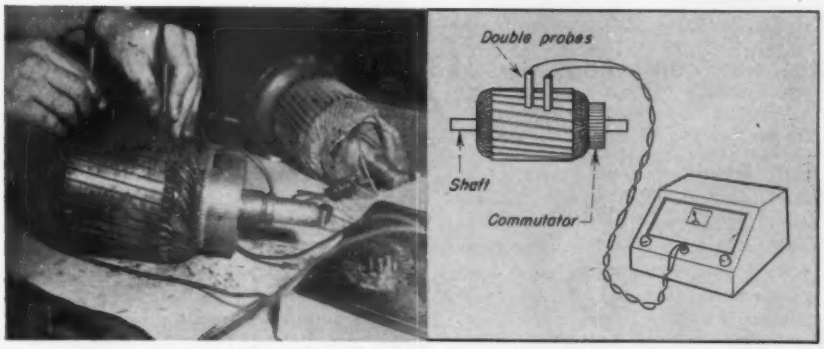
TEST 4.

Testing a field coil mounted on a pole in a motor. In this case, the basic growler above is used, with the double probes. As shown, each probe is held on one side of the pole iron, touching the coil. The coil leads must be disconnected and free of contact with each other. Presence of a short will be indicated by meter deflection. Testing principles are basically the same as in the case of the coil tester accessory.



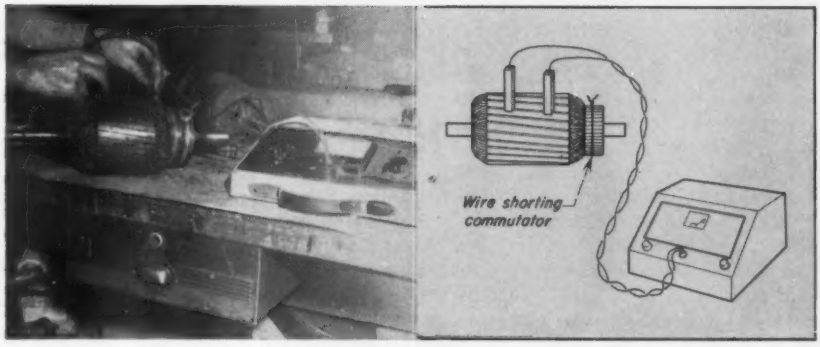
TEST 5.

Testing an armature for shorts in the windings. In this test, only one slot at a time is covered with the single probe. The size of the probe to be used depends upon the size of the armature and the spacing between slots. As large a probe as possible should be used. A high reading on the meter will indicate presence of a short or a reverse connection of coil leads.



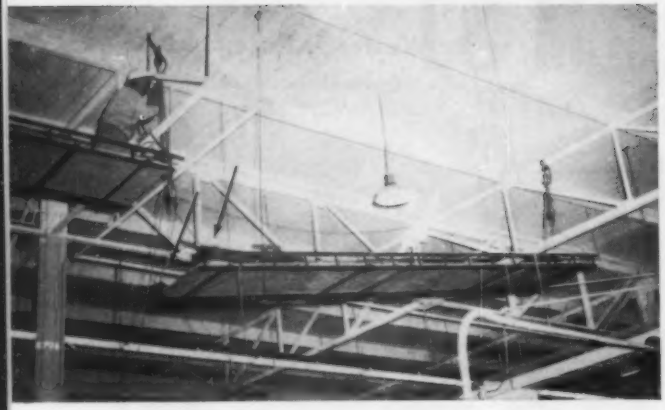
TEST 6.

Testing for shorts on an armature with skewed slots. In this case, a single probe cannot be used because it cannot lie flat on the armature surface along a skewed slot. The double probe is used here. Presence of shorts will be indicated by deflection of the meter pointer.

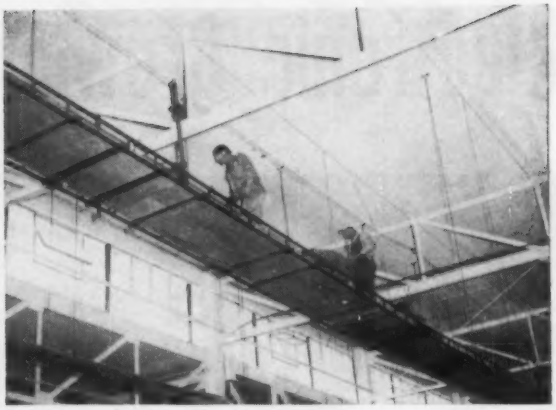


TEST 7.

Testing for opens in an armature. For this test, a bare conductor is wrapped around the commutator to short all its sections. The double probes are then moved along the slots. No deflection will indicate presence of an open circuit. Each slot is probed in turn.



CATWALK SECTIONS were hoisted into position by means of slings, blocks and tackle, with end hooks (see arrows) folded down flat against tubular side frames. Length of each section is equal to distance between roof trusses, thereby facilitating erection, insuring firm anchoring, eliminating sway and simplifying section-to-section connections.



PIPE-FORMED HOOKS, attached and pivoted to catwalk sections by special clamps, were slipped over lower chords of roof trusses to establish firm bearing points. Rigidity and strength of light-weight sections provided safe working space for several electricians in each bay, high above unobstructed helicopter-production areas.

Sectional Catwalks Aid Plant

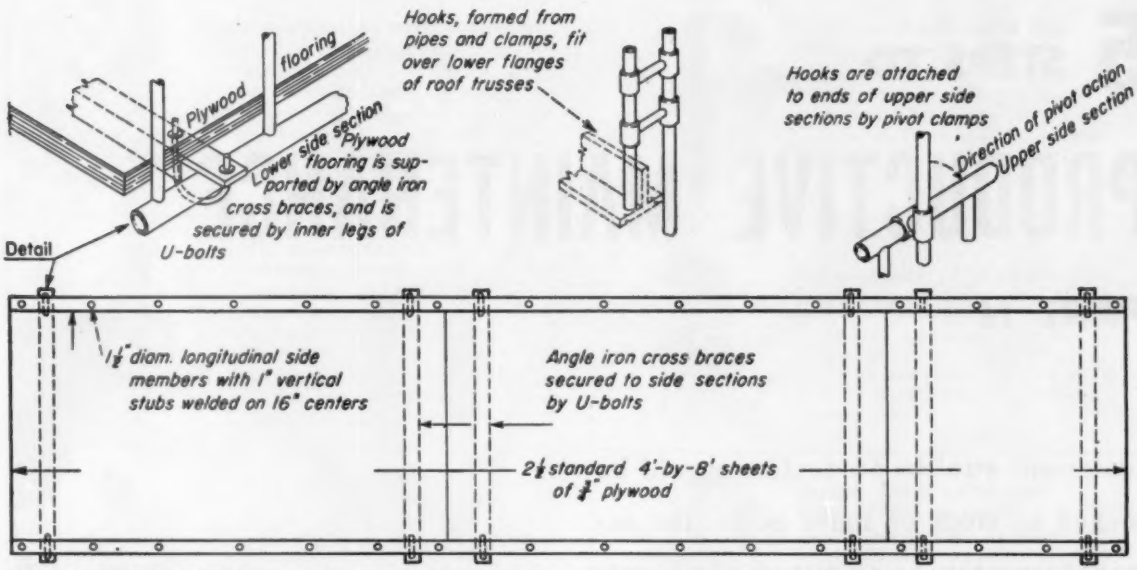
To avoid scaffolding in production areas Schwartz and Lindheim of Oakland devised sectional catwalks swung between trusses, then worked from elevated walk-ways to install new continuous rows of 3-lamp fluorescent fixtures.

AT THE Hiller Helicopter plant in Palo Alto, Calif., a relighting job had to be done. But production floor space could not be obstructed with scaffolds or ladders. Oakland electrical contractors Schwartz and Lindheim solved the problem by constructing nine sectional catwalks that could be swung from truss to truss to straddle the 36,000 sq ft production area so that electricians could work aloft without interfering with floor based operations.

Since trusses in the plant were on 20-ft centers, this same over-all dimension was selected as the length of each catwalk section, with 2½ sheets of standard 4-by-8-ft ¾-in.-thick plywood being used for the flooring of each section. Catwalk sides were of ladder construction, with short 1-in.-diameter pipe stubs welded intermittently between the full-length 1½-in. conduits. Each pair of side sections was bridged at six points by means of angle irons, with all intersection points between side sections and cross bars being securely bolted. Then, to provide suspension mediums at each truss line, both ends of each side section were fitted with pipe-formed hooks which could be slipped over the lower flanges of the various trusses. These hooks were pivoted where they were attached to the ends of the side frames, permitting the hooks to be folded down flat against the catwalk when so desired for storage or transportation from one location to another.

With catwalk sections so dimensioned and so constructed, it was a fast, simple operation to hoist them into position to form a 180-ft continuous walk-way above Hiller's machine, tool and die shops, as well as above the sheet metal assembly, production and precision inspection areas. Then, when it became necessary to shift this aerial walk-way laterally to a new fixture line, the various sections were progressively unhooked from truss chords, hooks were folded down flat against the catwalks, sections were swung into their new positions by means of slings, blocks and tackle. The hooks were again raised at right angles to the side sections; they were again slipped over truss chords, and bolts were tightened to prevent swaying.

Using these catwalk sections in this manner, Schwartz and Lindheim installed four continuous rows of 2- and 3-lamp slimline fluorescent fixtures across the plant, using 75-watt single pin instant start lamps held by turret type lampholders. After each row was


Hooks, formed from pipes and clamps, fit over lower flanges of roof trusses
Hooks are attached to ends of upper side sections by pivot clamps
Direction of pivot action
Upper side section
Plywood flooring
Plywood
Lower side section
Plywood flooring is supported by angle iron cross braces, and is secured by inner legs of U-bolts
Detail
1½" diam. longitudinal side members with 1" vertical stubs welded on 16" centers
Angle iron cross braces secured to side sections by U-bolts
2½ standard 4'-by-8' sheets of ¾" plywood

EACH CATWALK SECTION, dimensioned to coincide with the span between roof trusses, had a 4-by-20-foot plywood floor, formed from 2½ standard sheets. Ladder-construction tubular side frames were cross-connected by angle-iron floor supports, while attachment to lower chords of trusses was obtained by means of pipe-formed hooks pivoted at ends of side sections.

Relighting

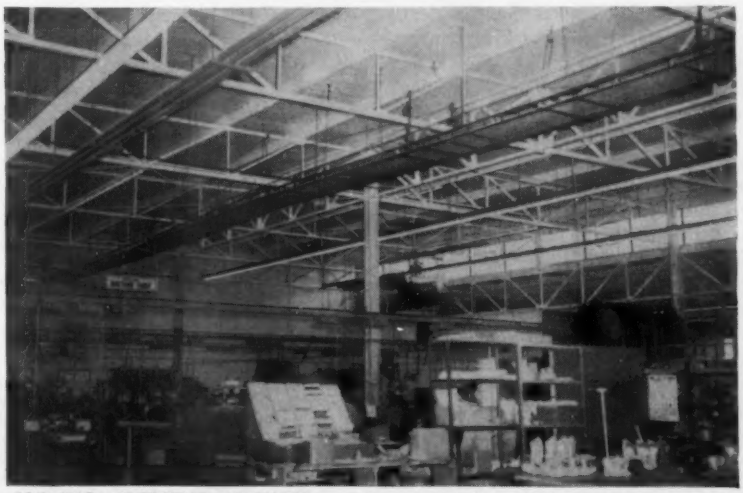
By Hugh P. Scott

NEW FLUORESCENT UNITS, installed by men working from readily-shifted catwalk sections, are 2- and 3-lamp industrial open-end luminaires equipped with 75-watt single-pin tubes and turret-type lampholders.

installed, wired and placed in operation, the old incandescent units were disconnected and removed. Then the catwalk was swung laterally to the next fixture line.

The result was an illumination boost from the 8-to-12-fc level to a 45-55-fc range, and the entire installation was completed within a month's time—without any major interruptions to critical production schedules.

Hiller's industrial engineer, Jack McKittrick, summed up his views of the job this way. "Relighting the plant resulted in a significant increase in production and an encouraging decrease in rejects. Also, due to the unique scaffolding methods used, interruptions to our production were negligible. So our hats are off to the speed, efficiency, ingenuity and general cooperation of our electrical contractors."



OLD INCANDESCENT FIXTURES, pendant-mounted on 20-foot centers in both directions, provided inadequate and uneven illumination of 8 to 12 footcandles.

5 STEPS TO . . .

PRODUCTIVE MAINTENANCE

PART II

Equipment vital to production should be backed by stock of spare parts; the extent of inventory being dictated by equating cost of repairs to overall cost of a production shutdown.

INVENTORY CARDS help decide optimum turnover rates. Upper card here lists the part's name and number, vendor, monthly usage and quantities. Lower card serves as in-and-out balance record. Colored tabs along bottom give fast general data.

IN ESTABLISHING an efficient operational control system, inventories should be checked periodically for completeness, since improvements in design and new products coming into use constantly extend the complexity of replacement parts, making it necessary to frequently add to stock supplies of relays, solenoids, timers, limit switches, electronic tubes and so on.

This growing demand for inventory stock adds greatly to inventory investment, so thought should be given to turnover. Turnover, simply stated, is the total cost of parts and materials moved in a year, divided by the yearly average value of the inventory. For example, a yearly inventory investment of $100,000 might have a normal carrying cost of an additional $12,000 —resulting from interest on money invested in the stock, shipping and handling costs, storage and insurance charges, clerks and losses due to obsolescence or deterioration. If stock turnover took place only once a year it would be necessary to allocate the full $112,000 to this item. If the size of inventory was reduced, however, and replaced more often, all these charges would be reduced (annual carrying costs and inventory investment as well) so that capital could then be released for other purposes.

It should be remembered, however, that there is an optimum turnover point; a point which it is not practical or economically sound to pass. Therefore the cost of acquisition should be carefully balanced against the cost of possession.

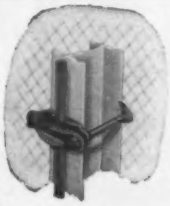
Accurate Stock Records

To avoid overstocking or understocking of items, to minimize obsolescence losses and to determine optimum turnover rates on all items, a properly organized inventory card system is imperative.

One card system which has proved practical lists the part name and number, the vendors of the article, monthly usage, in and out balance records, and so on. These figures indicate seasonal trends which might affect the frequency of ordering, they serve as a record of receiving parts, and show the value of those parts. To provide a fast, spot check of balances on hand, marginal colored tabs may also be used and shifted as stock levels vary. In this manner the stock status on all items can be shown without opening the files.

To initially approximate the desirable ordering quantity of any particular item in stock, it is recommended to multiply the monthly usage figure by one more than the procurement time. That is; if ten units of a certain item were used each month, and delivery time averages 4 months, then the item should be ordered when

This 2-part article is based upon a series of maintenance forums being presented in 26 of the nation's major cities by the General Electric Company. The highlights of these articles are also contained in a 25-minute full-color motion picture which will be made available for trade and association showings upon completion of the forums currently being held.



TYPE GA-H—CABLE TO H-BEAM FENCE POST—*This grounding connector joins wide range of standard H-beam posts to fence fabric and cable. Range of cables easily accommodated. Sizes available for grounding more than one cable. One-wrench installation.*

TYPE GD—2 CABLES TO PIPE
Clamp-type ground connector for joining range of two equal cables or single looped cable to pipe or column. Especially convenient for grounding fence posts. Wide range of sizes.

TYPE GX—CROSSED WIRES OR CABLES—*Simple, rapid connection, easy to inspect. Recommended for crossing ground conductors in order to secure greatest efficiency in reducing voltage gradient. Connector takes wide range of sizes.*

TYPE GB—CABLE TO FLAT SURFACE
Connects wide range of ground lead cable to flat structural or equipment surfaces. Can be furnished with larger than standard size bolts for pre-punched holes in steel work. One-wrench installation.

TYPE GP—2 PARALLEL CABLES 90° TO GROUND ROD—*Clamp-type connector joins two parallel cables at right angle to ground rod, pipe, or column. Accommodates range of cable sizes in each groove.*

TYPE GAR—CABLE TO ROD OR PIPE...PARALLEL OR 90°
Double-purpose ground connector—joins ground bus to rod or pipe either parallel or at right angles. Easily installed by tightening two nuts on U-bolt. Accommodates wide range of cable.

TYPE GK—3 EQUAL CABLES TO GROUND ROD OR PIPE—*This connector is frequently used to join grounding conductor, grounded member, and looped ground bus, at one point. Accommodates wide range.*

TYPE GG—BRAID, BAR, LEAF, OR CABLE TO PIPE—*Joins flat flexible braid or copper bar to ground pipes, fence posts, and columns. Highly effective for grounding operating rods, switch handles, gate posts. Can be used with stranded cable by splaying ends under clamp.*

TYPE YA (HYLUG)—GROUND CABLE TO FLAT BAR—*Compression connector—one-piece terminal, easily and economically installed with Burndy portable Hypress. Available for #8 str. to 1000 Mcm.*

9 sound solutions to the problem of

GROUNDING

Engineered to the same precise standards as connectors that carry continuous current loads . . . Burndy grounding connectors can be depended on to provide permanent protection against

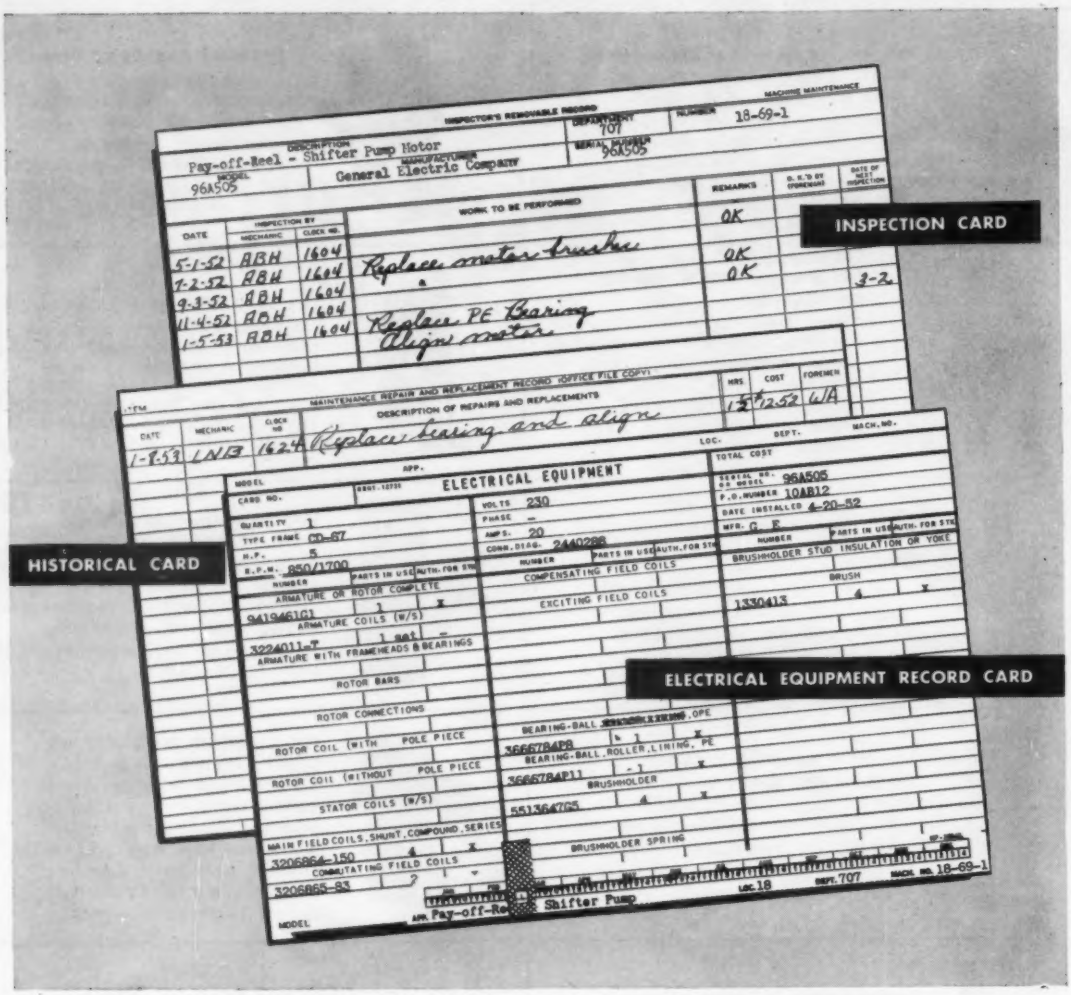
• ARC-OVERS • ELECTRICAL LEAKAGE
• LIGHTNING • DIRECT SHORT CIRCUITS

These nine designs are available in 30 variations for connection to driven rod, pipe, cable, fence post, structures, lamp standards.

Send for the Burndy Grounding Catalog, which offers an interesting technical discussion on approved techniques, methods, and materials for proper grounding.

BURNDY

NORWALK, CONNECT. — TORONTO, CANADA • *Factories:* NEW YORK, CALIF., TORONTO • *Export:* PHILIPS EXPORT COMPANY 54-1



EQUIPMENT RECORD CARDS reflect the value of a productive maintenance program. A good system should basically include equipment or machine numbers, information pertaining to application, purchase and installation, ratings and renewal parts, also inspection instructions.

the balance in stock drops below 10 times 5, or 50. How frequently this renewal point comes around is dependent upon the size of the order placed, and the size of the order is dependent upon experience, available stock space, available money to be invested, etc.

Since different manufacturers or suppliers use different numbers to identify identical items, attention should be exercised so as not to duplicate costly items. One good way to achieve this end is to buy from one supplier.

Step 4. Evaluate for Critical Maintenance

The first 3 steps in this discussion are fairly basic, covering items which are generally known and which should be more generally practiced. In fact, practice of the first 3 steps is essential to the successful application of these final 2 suggestions, concerning the maintenance of items vital to production.

Equipment can be considered "vital" only if its failure could delay or halt production. Therefore appraisal should be made of a machine's percentage of utilization, lack of by-passing equipment which might be substituted, duty cycles and the like. When all vital equipment is thus designated, its condition should be ascertained and the cost of its failure should be closely evaluated.

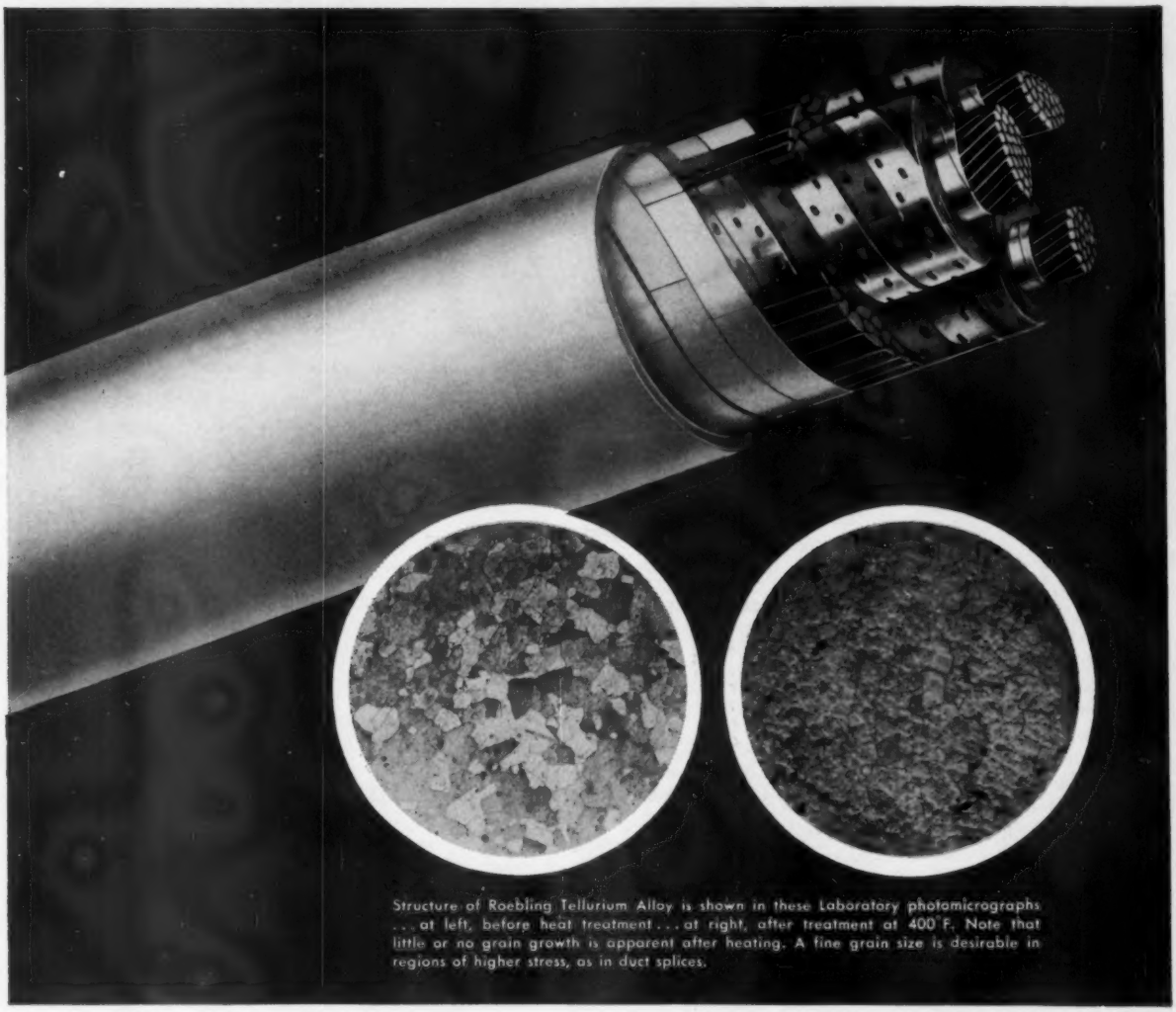
In this connection, the age of each critical machine should be considered, for some insurance companies consider a 20-year-old machine to be a poor risk, since the probability of breakdown and difficulty of duplication is considerable after that length of service. That applies even to machines kept very clean and given good routine maintenance with windings periodically varnished, for the unit is still subject to turn-to-turn short circuiting, open circuiting or grounding of the conductors. These conditions in inaccessible windings cannot be determined by either visual or electrical inspections and tests, yet repeated surges or overloading might have contributed to the oxidation of materials used for the original manufacture of the windings.

Having determined the critical importance of each piece of electrical equipment, the next objective is to find out which maintenance parts should be stocked as "insurance"—parts whose use cannot be predicted, such as spare armatures, large coils or complete motors.

This can be done by;

1) Deciding which parts are most

ROEBLING TELLURIUM ALLOY LEAD SHEATH ASSURES FAR LONGER CABLE LIFE



Structure of Roebling Tellurium Alloy is shown in these Laboratory photomicrographs . . . at left, before heat treatment . . . at right, after treatment at 400° F. Note that little or no grain growth is apparent after heating. A fine grain size is desirable in regions of higher stress, as in duct splices.

BIGGER LOAD REQUIREMENTS! Higher temperatures! Increased movement of cable during load cycles! Today's best answer to each of these conditions is Roebling Paper Insulated Cable with Tellurium Alloy Lead Sheath*—the Roebling lead alloy that has completely superior resistance to fatigue.

In addition, Tellurium Alloy Lead Sheathed Cable has a lower long-time creep rate...high bursting strength...remarkable stability under heat application as in duct splicing and wiping. And on top of that, it eliminates need for frequent stop joints or reinforced lead sheath...does not require generous expansion bends or large manholes.

Write us now for full information. John A. Roebling's Sons Corporation, Dept. 707, Trenton 2, New Jersey.

*Licensed under Patent 2588095 March 4, 1952 and App. No. 308710, Sept. 9, 1952.

ROEBLING

SUBSIDIARY OF THE COLORADO FUEL AND IRON CORPORATION

JOHN A. ROEBLING'S SONS CORPORATION, TRENTON 2, N. J. BRANCHES: ATLANTA, 934 AVON AVE. • BOSTON, 51 SLEEPER ST. • CHICAGO, 5525 W. ROOSEVELT RD. • CINCINNATI, 3253 FREDONIA AVE. • CLEVELAND, 13235 LAKEWOOD HEIGHTS BLVD. • DENVER, 4801 JACKSON ST. • DETROIT, 915 FISHER BLDG. • HOUSTON, 6216 NAVIGATION BLVD. • LOS ANGELES, 5340 E. HARBOR ST. • NEW YORK, 19 RECTOR ST. • ODESSA, TEXAS, 1920 E. 2ND ST. • PHILADELPHIA, 230 VINE ST. • SAN FRANCISCO, 1740 17TH ST. • SEATTLE, 900 1ST AVE. S. • TULSA, 321 N. CHEYENNE ST. • EXPORT SALES OFFICE, TRENTON 2, N. J.

subject to failure, then calculating the repair time if (a) no major parts were stocked, (b) some major parts were stocked, (c) all major parts were stocked or (d) a complete unit was stocked;

2) Determining cost of repair and cost of inventory for each of these possible conditions;

3) Totalling this information to determine the total "failure" cost;

4) Analyzing total cost for each condition to determine what items should be stocked to protect the equipment.

For example, as indicated in the accompanying sample Failure Cost Analysis, the failure of a 500-hp slow-speed dc motor on a critical paper-mill production line could range anywheres from $180,730 down to $31,350, depending on the ready availability of stock parts, the resultant down time for repairs and the value of the inventory items. In the sample study, the problem is based on the assumed failure of an armature.

Step 5. Establish a Planned Program

Having determined the proper degree of protection and the need for overhaul for each piece of critical equipment, the final step is to take action, establishing a planned program for handling critical maintenance.

To do this, get the most important replacement parts first, then purchase the rest of the critical stock on a planned budget basis. Critical equipment should also be subjected to renewed thoroughness in inspection and routine maintenance.

Overhauls should be planned well in advance whenever possible so that all necessary men, tools and materials can be made available at the proper time. These overhauls can then be scheduled for normal down periods, holiday shutdowns, off-season production periods or vacation closings.

Since planned overhauls are far less costly than the unplanned shutdowns which they eliminate or minimize, the planned overhauls should be scheduled whenever equipment has operated over a reasonable service life. These overhauls should be fairly comprehensive, including rewinding, rebuilding or modernization favorable to improved production purposes. These overhauls, naturally, should consider anticipated future replacement or retirement of the units, for if equipment is only to be used for a short period it may be good economics to assume the risk of

EVALUATION OF PLANNED OVERHAUL REQUIREMENTS

DATE _____

LOCATION _____ DEPARTMENT _____ MACHINE NO. _____

MACHINE RATING _____

AGE SINCE INSTALLATION OR LATEST OVERHAUL _____

OPERATING CONDITIONS (ATMOSPHERE-TEMPERATURE) _____

HOURS OPERATION PER DAY _____

ELECTRICAL CONDITION READINGS _____

CONDITION OF INSULATION _____

MECHANICAL CONDITION _____

POSSIBLE RETIREMENT OR REPLACEMENT OF MACHINE _____

PRODUCTION TIME LOST FOR PLANNED OVERHAUL	TOTAL DOWN-TIME COST	COST OF PLANNED OVERHAUL	TOTAL PLANNED OVERHAUL COST
_____ DAYS	$_____	$_____	$_____

PRODUCTION TIME LOST IN EVENT OF MAJOR FAILURE	TOTAL DOWN-TIME COST	COST OF REPAIR & PARTS	TOTAL FAILURE COST
_____ DAYS	$_____	$_____	$_____

COMPARISON of costs for planned overhauls vs breakdown shutdowns requires cooperation between production and maintenance departments. Comparison is affected by percentage of utilization, and availability of by-pass equipment.

EVALUATION OF CRITICAL PARTS PROTECTION REQUIREMENTS

(The Evaluation is based on the failure of a part which requires the longest repair time such as armature coils)

	NO MAJOR PARTS STOCKED	ARMATURE COILS STOCKED	COMPLETE ARMATURE STOCKED	COMPLETE MACHINE STOCKED
REPAIR TIME	10 days to make coils X	6 days to rewind armature X	7 hours to install new armature	3 hours to replace motor
TOTAL DOWNTIME COST	$168,000	$100,800	$4,900	$2,100
COST OF PARTS PROTECTION	0	Coils: $4,664	Armature: $25,600	Motor: $46,000
COST OF REPAIR	$12,730	$5,900	Installation: $850	Installation: $360
TOTAL FAILURE COST	$180,730	$111,364	$31,350*	$48,460*

X Add disassembly, assembly and transportation time to actual repair time.
*Add repair cost, on straight time basis, of failed unit.

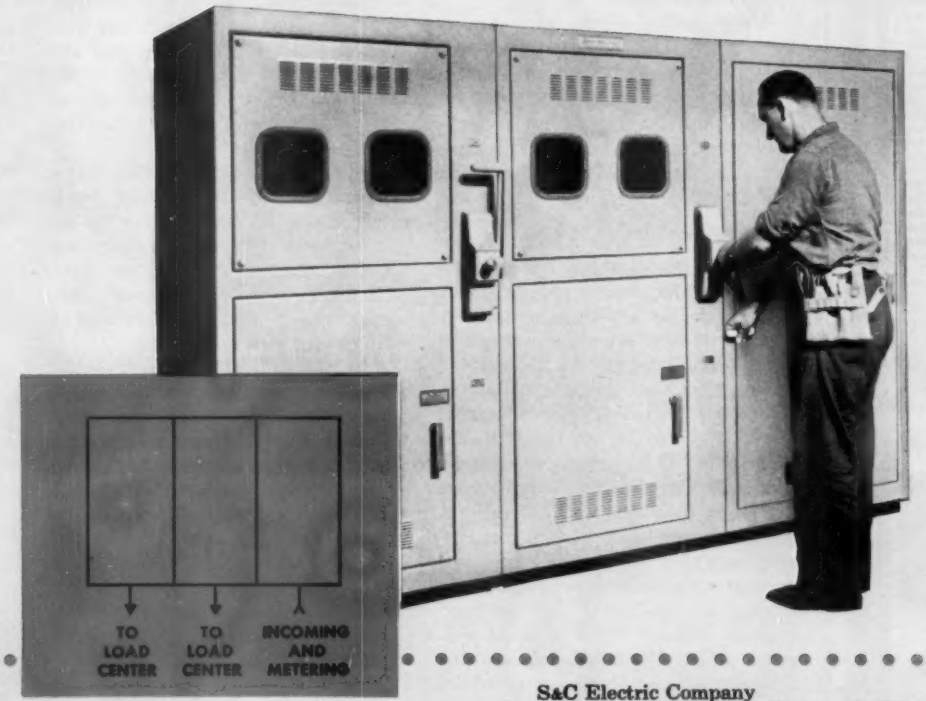
COST OF A FAILURE depends upon length of downtime, resultant interruptions to production, available spare parts or units on hand. This study involves a 500-hp slow-speed dc motor on a machine critical to production in a large paper mill.

METALCLAD SWITCHGEAR

Cuts Cost of Power System in New Motorola Plant

Reviewing original proposals for Motorola's new assembly plant, Crescent Engineering Co.—contractor-engineers of Chicago—recommended installing a high-voltage power system to trim material and operating costs. Choosing S&C Metalclad Switchgear to protect and switch the feeders, they reduced high-voltage equipment costs by one half.

To get the most from your construction budget, specify S&C Metalclad Switchgear. Whether your plans for high-voltage power supply are tentative or settled, you can materially reduce your equipment costs with S&C. For booklet containing complete information, send coupon below or address request on company letterhead.



Power is taken in and metered at 4160 volts in the first bay on the right. The following two bays provide protection and switching for the feeders, the center bay serving the fire pump for the sprinkling system, and the left-hand bay supplying load centers in the process and storage areas of the plant. Provisions have been made for adding bays as plant operations expand.

Mr. John J. Chapp

President of Crescent Engineering Co. suggested a high-voltage power system with S&C gear to help trim Motorola's construction budget. He says, "Since we engineer every job on which we work, we *must* select equipment that will provide our customers with the best possible service. Our years of experience have shown us that S&C Metalclad Switchgear meets our quality standards and provides lasting, dependable service."

S&C Electric Company
4433 Ravenswood Ave., Chicago 40, Illinois

Please send me your new booklet on S&C Metalclad Switchgear. No obligation on my part, of course.

Name_____ Title_____

Company_____

Address_____

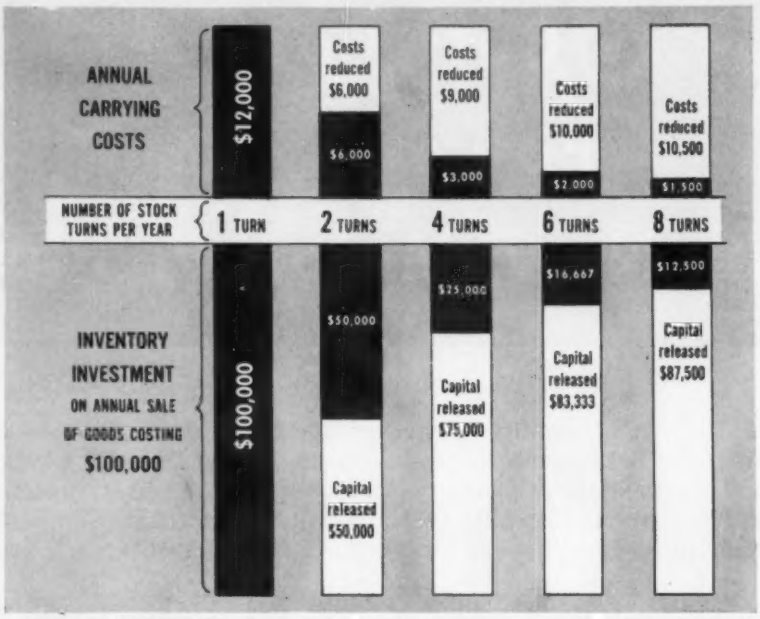
City_____ Zone____ State_____

Your move for fast deliveries...

GUARANTEED
WIRING DEVICES
NO-KLIK®
QUIET SWITCHES
No. 3401 Bakelite — A.C. Only — Silver Contacts. Quiet Operation Without Mercury or Other Fluids. Not Down Rated. Lifetime Performance. L Rated (T rating for A.C. Switches). Operates in any position for both Incandescent (Non-inductive) and Fluorescent (Inductive) lamp loads. Back or side wiring; strip gage. Approved for control of Fluorescent Lamps on A-C circuits of 277 Volts and less, and for motor loads up to 277 Volts at 80% of current rating of the switch. Totally enclosed mechanism with large head No. 8 binding screws. Takes any wire size up to No. 10. 15 AMPS.—120 to 277V., A-C only.
Rear View #3401 (Showing Back Wiring and Strip Gage)
No. 3421 20 AMP. SWITCH. Identified by Red Moulded Cover. Approved for control of Fluorescent Lamps on A-C circuits of 277 Volts and less and for motor loads up to 277 Volts at 80% of current rating of the switch. 20 AMPS.—120 to 277V., A-C only.
50 YEARS
CIRCLE F MFG CO.
TRENTON 4, NEW JERSEY

Productive Maintenance

. . . Starts on page 102



INCREASED TURNOVER of inventory reduces investment and annual carrying costs related to interest on investment, shipping and handling costs, storage, insurance, wages of clerks and obsolescence. Cost of acquisition should be balanced against cost of possession.

operating over that short period with routine maintenance.

When planned shutdowns and overhauls are contemplated, it is also sensible to consider entire production operational cycles rather than individual machines, so these reconditioning operations should also include secondary or dependent machinery as well as the key machine.

Related Procedures

The five steps just outlined are vital in a productive maintenance program, but they do not constitute a complete plan, for thought should also be given to budgeting, management reports and employee training.

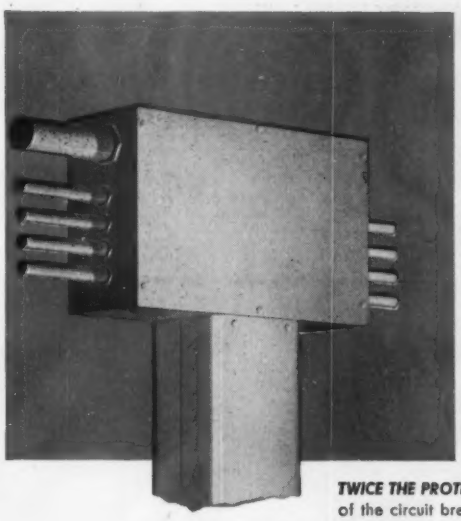
Without discussing these items in detail, it should be mentioned that a well-controlled budget is essential for successful productive maintenance. And only by putting the overall requirements and benefits before management in a clear, concise and graphical manner can a maintenance engineer be assured of top-drawer approval and financial backing. With a sound program effectively presented, authentically documented and supported by fact, management is then placed in the position of either accepting and following the recommendations or accepting part of the responsibility for future breakdowns and shutdowns.

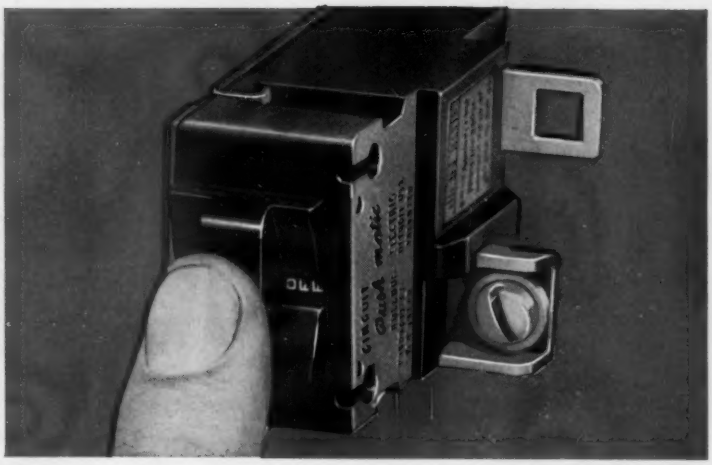
Management will naturally support a productive maintenance program only when it can be proved that production will benefit from the program. Therefore all activities should be reported, and the resulting continuity of operation should be emphasized as frequently as possible.

It goes almost without saying that a training program is likewise beneficial, for craft specialization is becoming more essential as equipment becomes more complicated, and specialization can be obtained only through study, practice and training of maintenance personnel.

Specialization is therefore desirable, yet general knowledge is also essential so that all maintenance personnel will at least recognize the symptoms requiring the attention of other crafts, trades or departments. This general training can be furthered by arranging lectures and discussions by representatives from various manufacturers or suppliers, providing a library for the use of employees, setting up mock problems and analyzing typical repair situations.

With these several steps recognized and followed in sequence, any plant can obtain definite returns through the application of planned productive maintenance procedures as practiced by competent men.





TWICE THE PROTECTION, TWICE THE CONVENIENCE! Famous Duo-Guard Pushmatic circuit breakers—the envy of the circuit breaker industry—protect circuits two ways—with a thermal bi-metal and a magnetic solenoid. So easy to operate. Just *push the button.*

NOW...BULLDOG PUSHMATIC CIRCUIT PROTECTION IN A

narrow, neat, space-saving panel

TRIM "NP" ELECTRI-CENTERS EXTEND TO ANY CEILING HEIGHT, ELIMINATE UNSIGHTLY CONDUIT

"NP" means Narrow Panel. And that means an attractive Pushmatic Electri-Center® you can install in space-restricted quarters, or where good looks are good policy.

BullDog engineers have designed this panel to fit into a standard "8" H-beam, or to surface-mount unobtrusively behind doors, in hallways, on non-structural walls—*anywhere!* It is compact—only 6¾" wide. Its many features include famous DUO-GUARD Pushmatic protection, wireway extensions and pull boxes to conceal wires and eliminate naked conduit, easier installation.

It is impossible to point out all the advantages of the Narrow Panel Electri-Center here. But a BullDog Field Engineer or Qualified Distributor will be pleased to show you its many saleable features. Or, write: BullDog Electric Products Company, Detroit 32, Michigan.

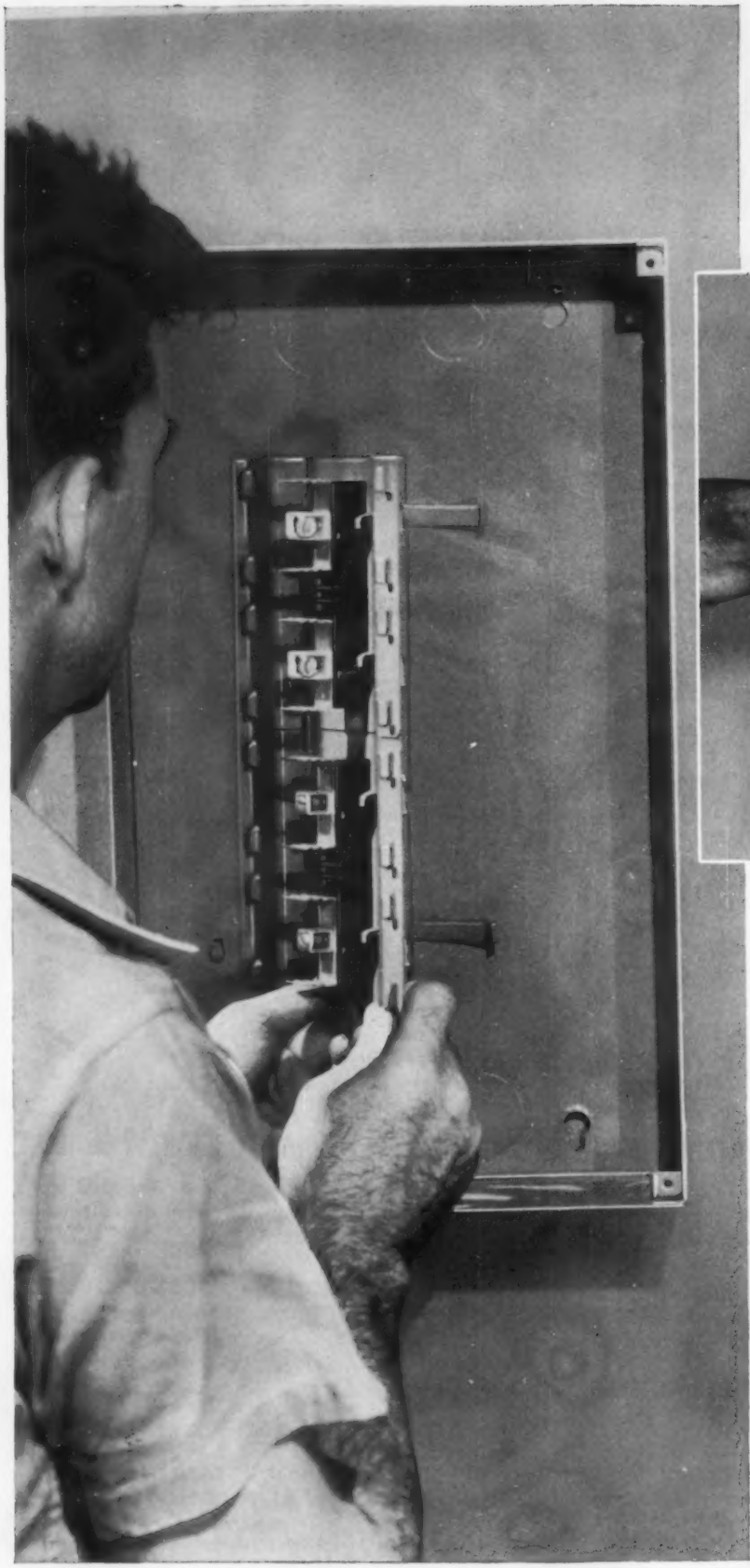
©BEPCO

IF IT'S NEW
. . . IF IT'S DIFFERENT
. . . IF IT'S BETTER . . . IT'S

BULLDOG
ELECTRIC PRODUCTS COMPANY
A Division of I-T-E Circuit Breaker Company

Export Division: 13 East 40th Street, New York 16, New York. *In Canada:* BullDog Electric Products Company (Canada), Ltd., 80 Clayson Road, Toronto 15, Ontario.

New G-E 7

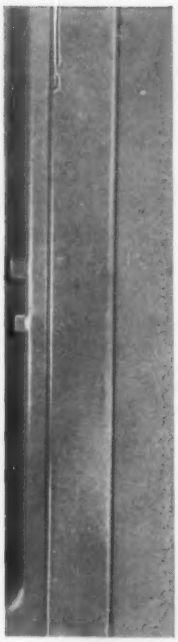


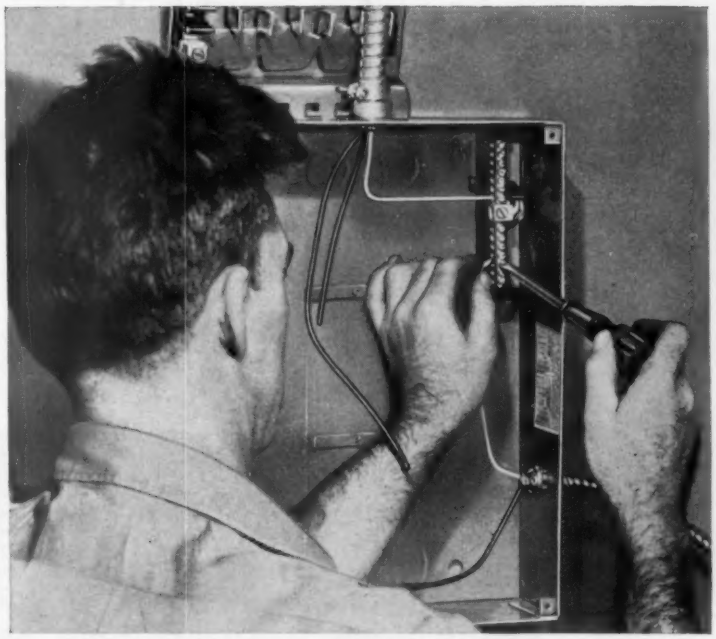
New Load Centers

NEW 20 CIRCUIT LOAD CENTER, Catalog Number TRP2010A (above) is easier to install! Exclusive spring mounting of interior permits flush cover to align perfectly with breakers and wall surface. Aligns *automatically*—no screws to adjust. G-E TQL Common Trip and Type R breakers plug in easily, are held positively.

NEW 16 CIRCUIT SPLIT BUS LOAD CENTER, Catalog Number TRPX1610 (left). Snap-in installation (no screws to adjust) means that interior can be removed or inserted with finger pressure. And note that this device eliminates the need for a disconnect switch, thus helping you hold down your material costs.

service entrance equipment gives you quality extras at no extra cost

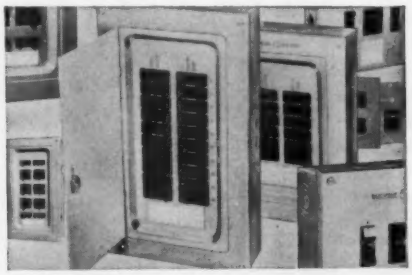




Feature Optional Doors and Locks

NEW 12 CIRCUIT LOAD CENTER, Catalog Number TRP1210A features modern straight-in wiring on all wire connections. Strip wire, insert straight in, and screw down for a permanent contact. No wire looping necessary. Can't pull out!

100 AMPERE LOAD CENTER AT 70 AMPERE PRICE! G.E.'s new 8 Circuit Load Center, Catalog Number TRP810A with all the G-E quality extras—lets you meet the growing need for 100 ampere service without spending an extra penny.



STANDARDIZE ON QUALITY! G.E.'s load center line—2 to 20 circuits—is now in stock. See your Trumbull Distributor or write General Electric Co., Trumbull Components Department, 48-61, Woodford Avenue, Plainville, Conn.

1. ***Snap-in installation***—interior snaps in or out—no screws to adjust—gives plenty of room for pulling wires. A G-E Load Center exclusive.

2. ***Automatic 2-way alignment***—spring mounted interior assures alignment of breakers with cover, and cover with plaster in flush mounting.

3. ***Straight-in wiring*** for easier installations—grips like a bear trap.

4. ***Silver-plated*** copper current-carrying connections. A G-E Load Center exclusive.

5. ***Bonderite* treated***—built-in protection against rust. A G-E Load Center exclusive.

6. ***Reversible boxes***—line wires may enter at top or bottom. Saves wire.

7. ***Excellent appearance*** made possible by quality construction and finish—in step with modern building materials and appliances.

*Parker Rust Proof Co.

GENERAL ELECTRIC

KUHLMAN

POWER CENTER TRANSFORMERS

in one of America's largest ultra-modern automotive plants

Kuhlman unit substation transformers, such as shown in the above power center, are designed to meet today's industrial expansion and modernization. In this installation six 1500 KVA Kuhlman dry type core and coil units are spotted close to the load areas in three compact double-ended power centers. Each power center contains two identical core and coil units, one serving as a right hand unit and the other, turned 180°, serving as a left hand unit.

Kuhlman Electric Company, employing the most advanced engineering and construction methods, can supply power center core and coil units or the complete transformer sections with enclosure. Forced air cooling may be added to increase the KVA capacity for either peak load conditions or plant expansion.

Be sure to specify Kuhlman power centers when planning your plant's expansion or modernization program.

KUHLMAN

KUHLMAN ELECTRIC COMPANY, BAY CITY, MICHIGAN, CRYSTAL SPRINGS, MISSISSIPPI, SALINAS, CALIFORNIA

Practical Methods

Strip Heaters Boost Concrete Vault Production

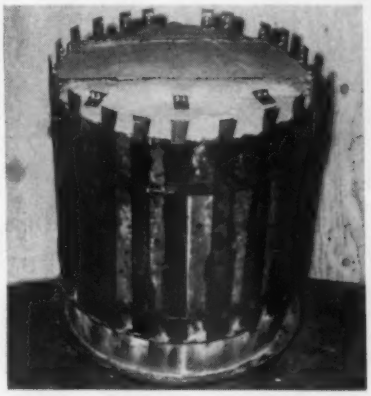
MANUFACTURING

Application of an asphalt composition lining to the interior of concrete burial vaults was creating a production bottleneck for a manufacturer of these units. The jam created by this operation was finally broken by the addition of approximately 14 kilowatts of electric strip heaters to the portable vats to keep the compound at pouring temperature.

Formerly the asphalt compound was heated in a large storage tank by a combination of gas and steam. The hot asphalt would then be drawn off into smaller containers which were moved by overhead trolley to a pouring position over each vault. After two or three vaults were poured, the compound in the vat would begin to harden and would have to be reheated before this phase of the operation could continue. The time wasted in reheating reduced vault output and the hazards created by additional handling of the containers posed a serious safety problem.

Management of the burial vault firm accepted the recommendations of an electric heater manufacturer and had the smaller, portable asphalt containers equipped with electric strip heaters. These units are mounted like staves around the outside of the inner tank wall and across the bottom. Each container is 37 inches high, 31 inches in diameter and consists of a double-wall tank with two inches of insulation and a fitted cover.

The asphalt compound in these 100-gallon containers is now kept at the 425° F pouring temperature at all times by thermostatic control and the pouring process can continue until the tank is empty. The initial heat-up time, in this instance, is not a serious factor, because as one tank is being used others are being brought up to temperature. A continuous cycle is thus maintained 24 hours per day. The vault-lining process has been speeded up to the point where a bottleneck no longer exists.



STRIP HEATERS are strapped around outside and across bottom of inner tank wall (shown upside down). Unit is placed in an outer shell to form portable asphalt container which rides on overhead trolley for pouring operation.

ELECTRICALLY HEATED asphalt tank is suspended above vault in which lining has just been poured. Thermostatically controlled strip heaters maintain pouring temperature as tank is moved from vault to vault, eliminate previous reheating operation.

Maintenance Boosts Battery Life by 50%

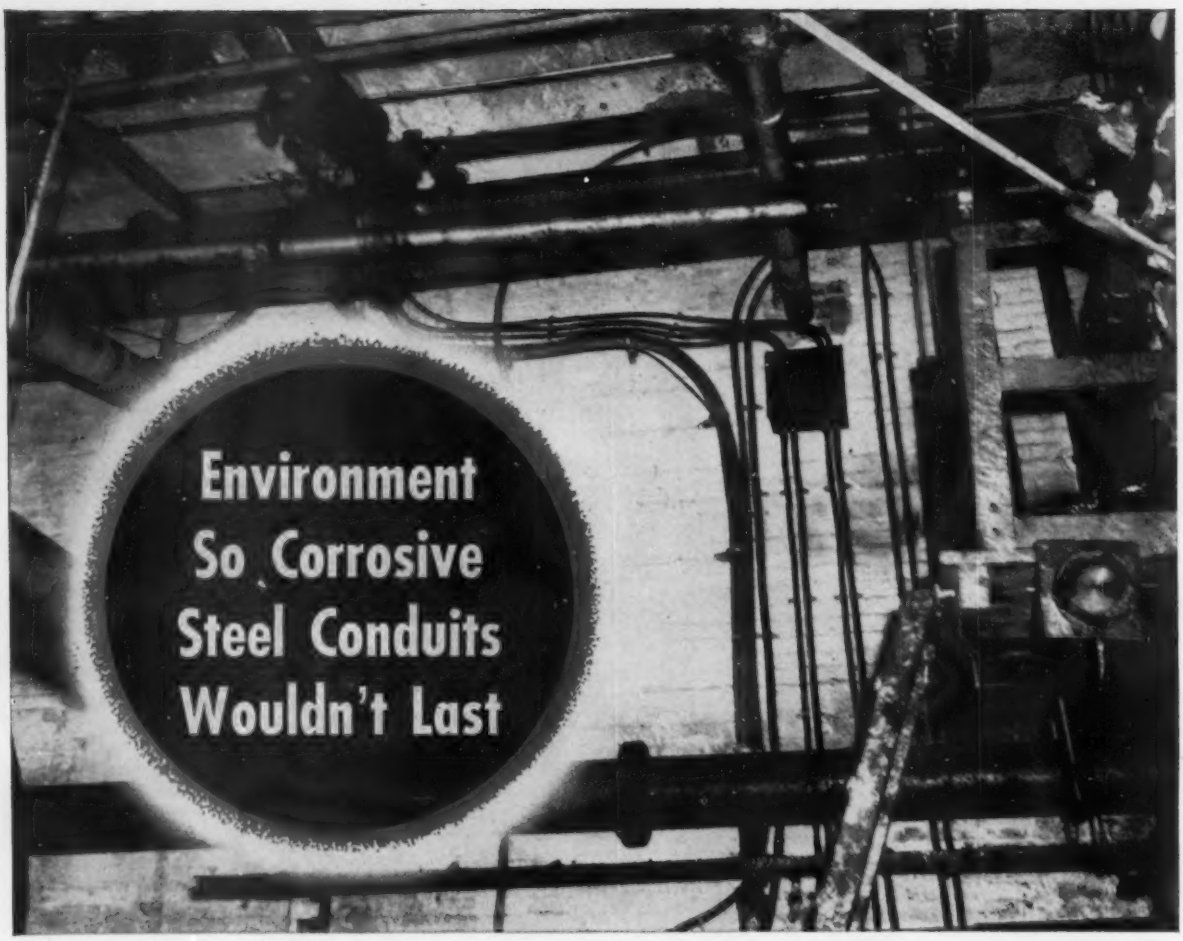
SERVICE AND REPAIR

Seldom is the economic wisdom of maintenance illustrated as convincingly as in the 47-acre plant of an eastern automotive manufacturer, where the life of industrial truck batteries has been increased 50% by the revision and improvement of their maintenance program. Since this program (revamped 2 years ago) covers 240 Gould-National batteries and 98 trucks, overall savings resulting from fewer replacements are considerable.

In this new set-up, all battery trucks are serviced at one central repair and charging area, to which they are driven when their power and speed begins to taper off. This power drop generally is noticed about 12 or 14 hours after each charging cycle, so trucks (operated around-the-clock) are returned to the maintenance depot approximately twice a day for battery replacement.

On these periodic trips to the depot, discharged batteries are removed with the aid of an overhead monorail hoist and are placed on skids; wide batteries being loaded on flat-top pallets, narrow and high batteries (capable of being more easily upset) being placed on skids fitted with wooden side walls and partitions. After a pallet or skid has been fully loaded, battery cells are checked for water level, water lost through evaporation is replenished, then skids are moved to charging positions along the walls of the charging room. Replacement of water prior to recharging promotes thorough mixing of the electrolyte during the charge.

In cases where batteries have accumulated dirt and dust, they are cleaned with brushes and water under



Paper mills are notorious for the difficult operating conditions they pose for electrical wire and cable. Caustic soda, liquid chlorine, steam, hot water, all these and more are the daily lot of the wire and cable illustrated. Even steel conduit disintegrated in a couple of years.

That's why this paper mill in northern Maine decided to clip these Anhydrex-insulated cables directly to the walls. They knew these Simplex cables would resist the action of acids, alkalies, water and heat.

These Anhydrex-insulated cables have now been in operation for more than ten years without time off even for good behavior. Can you say the same about your power and control cables? Would you trust your present cables to operate your plant under the same conditions?

Simplex ANHYDREX-INSULATED CABLES

SIMPLEX WIRE & CABLE CO., 79 Sidney Street, Cambridge 39, Mass.

pressure. Then they are dried thoroughly, using compressed air for that purpose. Once a month, exterior casings and covers are washed with baking soda to remove any residual acid which may have been spilled.

Once each week, all batteries also receive a slow, 4-hour equalizing charge to bring all cells up to full, uniform strength; and specific gravity readings are taken and recorded before and after all equalizing charges to verify cell condition and the effectiveness of the service operation. In the event that a cell does not come up to full strength, the battery is thoroughly checked to determine the reason, and the cause is corrected.

Analyzing recurrent faults is frequently speeded by referring to the records, for each charging operation is identified by date and time, battery and truck number, initial and final specific gravity readings, the truck to which the battery is assigned, and so forth. By referring to these history cards, irregularities in performance are quickly spotted and corrective measures can be taken before the battery sustains serious damage.

From this experience it has been noted that individual cells can be affected differently by such factors as temperature, position of cell in the tray, water level, undercharging or overcharging.

COMPREHENSIVE CHECK-UP of 42 items is regularly scheduled (on bulletin board in background) for each of the 98 trucks in the 47-acre plant. Planned maintenance program has increased battery life by 50 percent.

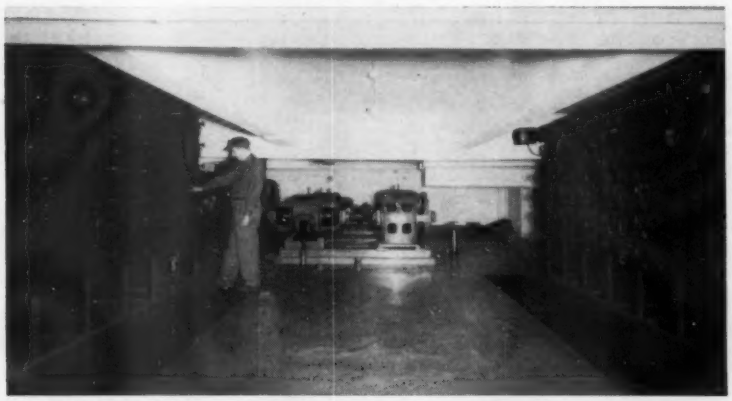
MONORAIL HOIST, electrically operated, removes truck batteries for recharging. Replacement units are then installed so that trucks may operate continuously. Batteries are recharged after 12-14 hours of service and trucks are comprehensively serviced on a fixed rotation basis.

PALLETS AND SKIDS, some of them having sides and partitions to prevent batteries from tipping over, are moved around the charging room by means of a manually operated "walkie" truck. Total of 240 Gould-National batteries are kept in rotation to furnish power for 98 trucks in this plant.

In addition to maintenance of the batteries, each truck is checked for a total of 32 items every two weeks and, every eight weeks, the truck is exhaustively checked for a total of 42 items. The findings of all check-ups are entered in the records, together with dates, cost of labor and replacement parts, length of maintenance down-time and estimated consumption of power. These records are so complete that through them, basic changes in truck design have been made.

Charging control panels and generators are located above the charging racks, each control being numbered to correspond with charging leads in the battery room, and generation being handled by two operating units (with a third generator standing by for emergency use if necessary).

As a result of this practical maintenance program, battery life has been increased by half, and total operating charges per truck have been cut 20%. With this tangible result fully recognized and appreciated similar revisions and modernization of maintenance programs covering all electrical equipment in the plant is now under way.



GENERATOR ROOM, with two operating units and one standby unit set, is located on floor above charging area. Control panel has capacity for 86 charging leads. Leads and controls are correspondingly numbered to promote safety and accuracy of operation.

WATER LEVELS are checked and brought up to full-cell height before charging cycle, thereby promoting more thorough mixing of the electrolyte.

Combination Unit containing:
1-100 amp. fused main pull-out
2- 60 amp. fused pull-outs for range and water heater
12- 30 amp. branch circuit fuses

CLARK adds MORE THAN A NEW LABEL

to "American" Service Entrance Equipment

"American" Service Entrance Equipment is now a part of the Clark line of high quality electrical products. Thus the "American" line now represents the combined manufacturing and engineering skill of Clark Controller, and the specialized experience of American Electric Switch—both in business for over a quarter century.

The new Clark-American label assures now that all American Electric Switch products are manufactured to the same rigid specifications that guarantee the dependability, quality, durability and long trouble-free service of other products that bear the Clark trademark.

Factory stocks, complete stocks in strategically located warehouses, plus stocks on shelves of distributors throughout the country, provide fast, efficient delivery of the following:

General Purpose Switches
Fuse Pull-out Service Entrance Switches
Fuse Pull-out Main-Range-Lighting Combinations
Door Pull-out Service Entrance Switches
Toggle Type Service Entrance Switches
Fuse Cabinets and Branch Circuit Attachments
Outdoor Service Entrance Switches
Outdoor Safety Switches
Fused Lighting Panelboards
Dead Front Distribution Panels
Magnetic Circuit Breaker Panelboards
Quicklag "De-ion" Panelboards
Nofuze Lighting Panelboards

Write for complete description and prices.

American
ELECTRIC SWITCH DIVISION

The **CLARK CONTROLLER** *Company*

1146 East 152nd Street, Cleveland 10, Ohio

Drill Press on Skids Used as a Hole Cutter

TOOL

A standard homecraft bench-type drill press was used effectively to cut hundreds of 2-in. diameter openings in the deck of the Fenestra-NEPCO cellular steel floor system in the South Dakota Highway Commission's new office building at Pierre, S. D. Baumgartner Electric Company (Rapids City, S. D.), project electrical contractor, equipped the unit with wood skids so it could be moved quickly from one outlet location to the next. Foot pressure on the skid holds the assembly firmly in place during the cutting operation.

SKID-MOUNTED DRILL press cuts 2-in. diameter tapered openings in steel deck of Fenestra-NEPCO cellular floor in 20 to 30 seconds with water as a coolant. Mechanic steadies unit with foot, applies cutting pressure with drill press hand feed.

ADJUSTING CUTTING BITS seated in self-tightening chuck at 45-degree angle to chuck and pilot pin. Hole diameter can be varied from 2 to 5 inches by raising (smaller) or lowering (larger) the two bits.

To use the unit, the mechanic merely turns the chuck spindle 180 degrees from normal drill press position and locks it on the upright post. In this position, the chuck extends beyond the skid-mounted base and can be centered directly over the opening to be cut. A ½-hp, single-phase, 115-volt, 1725 rpm, motor with a 3-step, V-belt sheave provides the power. Its weight acts as a counter-weight and helps eliminate bucking. The V-belt connection between a 2-in. diameter sheave on the motor and a 10-in. diameter sheave on the spindle provides a cutting speed of about 350 rpm.

Actual cutting of the 16-gauge steel deck is done with a Wyco hole cutter which fits any standard ½-in. drill chuck. The tool consists of a self-tightening chuck (twist-type) which holds two cutting bits at 45-degree angles to the spindle and pilot pin. Both bits are made of tool steel and can be adjusted individually up or down to cut holes from 2-in. to 5-in. diameter. Water, rather than oil, was used as a lubricant on the hole cutting operation for two reasons. It is more efficient as a lubricant and it eliminates the possibility of oil deposits accumulating in the raceway cells.

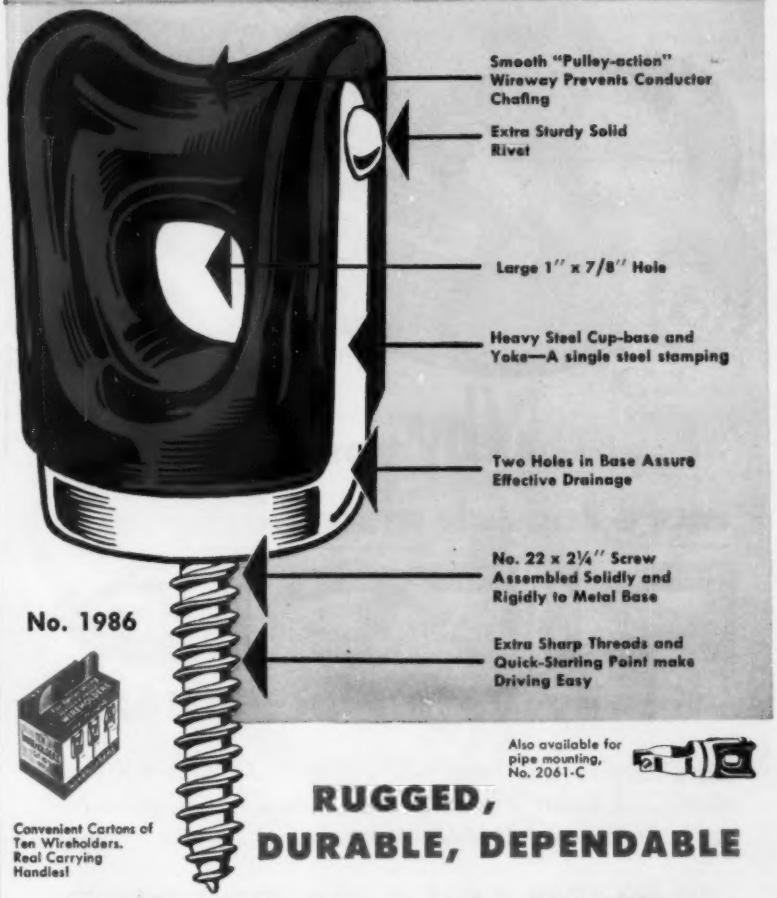
Normal procedure on the Pierre project consisted of first spotting locations of the openings on the deck, then drilling pilot holes at these points with a standard electric drill. The hole cutter then went down the line cutting the 2-in. tapered holes. Actual cutting time ranged from 20 to 30 seconds per opening. The final step consisted of inserting a threaded outlet flange in the opening and securing it to the floor deck with a threaded coupling. Adjusting sleeves and closing plugs were added where necessary.

Voltage Flexibility at Test Bench

INSTRUMENT

A special portable test bench with several different voltages immediately available has been designed by M. C. Parsons, superintendent of the Electric Hoist Dept. of Gulf Electric Company, Houston, Tex. The setup allows testing of electric hoists rated at any of the common voltages. The bench is mounted on casters and can easily be pushed around the shop to any of the test racks at which hoists are tested. At the test rack, a hoist is supported from a cross-bar and made to lift a dummy load—one of several concrete blocks which are used as test weights. The power cord from a hoist under test is quickly and readily plugged into a connector on one of the cords from the power supply on the portable test

You can't buy a BETTER wireholder


Smooth "Pulley-action" Wireway Prevents Conductor Chafing
Extra Sturdy Solid Rivet
Large 1" x 7/8" Hole
Heavy Steel Cup-base and Yoke—A single steel stamping
Two Holes in Base Assure Effective Drainage
No. 22 x 2¼" Screw Assembled Solidly and Rigidly to Metal Base
Extra Sharp Threads and Quick-Starting Point make Driving Easy
No. 1986
Also available for pipe mounting, No. 2061-C

Convenient Cartons of Ten Wireholders. Real Carrying Handles!

RUGGED, DURABLE, DEPENDABLE

When you want *Quality* and *Performance* in a wireholder, choose Porcelain Products' No. 1986! You just can't buy a better, more dependable wireholder! Porcelain Products' No. 1986 wireholder is made with strong, sturdy construction — metal in tension — porcelain in compression . . . for customer satisfaction. Steel parts, including the screw, are hot-dip galvanized—screw threads are extra sharp, lubricated for ease of installation. Larger, pulley-action wire hole—for easy installation of large wire sizes—prevent conductor chafing.

These *EXTRA* features—*plus*—Porcelain Products' "Quality Line" reputation—a byword for generations, make the No. 1986 wireholder the one to specify where you must discriminate . . . be quality conscious.

Quality You Can Trust

ELECTRICAL PORCELAIN SINCE 1894

61 years Porcelain Products, Inc. PP INC

FINDLAY, OHIO

Why you cut more conduit more easily with RIDGID Heavy-Duty Pipe Cutters

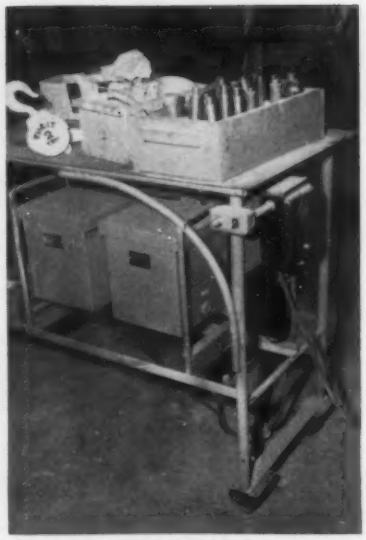
Extra easy to use—beautifully balanced, you work with least effort . . . high alloy thin blade or heavy-duty cutting wheels roll right thru any conduit, almost burrless cuts . . . perfect tracking.

Extra long service—special malleable housings guaranteed not to warp or break . . . every cutter individually tested before shipment, all 6 sizes—⅛″ to 6″; 4-wheel cutters to 4″.

For most for your money, buy RIDGID . . . Your local Supply House stocks them for you, gets them to you fast as you need them.

THE RIDGE TOOL COMPANY • ELYRIA, OHIO, U. S. A.

RIDGID
Work-Saver Pipe Tools



PORTABLE TEST BENCH is supplied at 220 volts, 3-phase by long cord plugged into wall receptacle; has output connectors for 220 volts single-phase and 3-phase, and uses two open-delta connected single-phase transformers providing output of 440 volts 3-phase.

bench, depending upon the voltage required.

The test bench is constructed of angle iron, flat stock and pipe, as shown in the photo. A trailing cable can be seen coming from the right up to a 5-hp, 3-pole magnetic contactor (black enclosure) on the right hand end of the bench. The trailing cable plugs into a 4-pole, 3-phase, 220-volt, grounded receptacle on one wall of the shop interior. The cable consists of three phase conductors plus an equipment ground conductor connected to the fourth pole in the wall receptacle. At the top of the near leg of the bench, alongside the contactor, is a toggle switch for operating the contactor coil circuit. In combination with the switch is a pilot light.

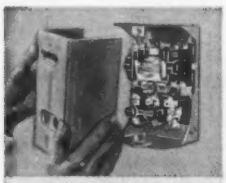
Two cords come out of the contactor; one has a receptacle connector to pick up 220-volt, single-phase loads; the other has a 3-phase, 4-pole (3-pole plus ground) connector which takes the plug on a special connecting cord. This 4-conductor cord, 3 hot and 1 ground, runs to a connector which takes the plug from a transformer hookup. Another cord is spliced to the special one and feeds other 4-pole, 3-phase, 220-volt, grounded cord connectors.

The transformer hookup consists of two single-phase, 3-kva units connected open delta for 220-volt, 3-phase primary to open delta 440-volt, 3-phase secondary. To provide flexible use of the overall setup, a number of cable harnesses of different lengths and different arrangements of connectors are kept in a box on the shelf under the bench top.

Now Cutler-Hammer ★★★ Motor Control in NEMA Size 2 for motors up to 25 HP*

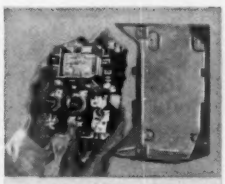
It is here . . . Cutler-Hammer ★★★ Motor Control for your larger motors, NEMA Size 2 Starters with the famous three stars on the Cutler-Hammer nameplate. The three stars that stand for three entirely new standards in motor control performance and value. Star #1: Installs easier. So much easier that installation savings often exceed the cost of the control. Star #2: Works better. So much better that this control often pays for itself many times over in just the production interruptions it avoids. Star #3: Lasts longer. So much longer that this control *never* needs maintenance care or expense in 90% of its uses. If you are one of the many users who have proved these are facts, not mere claims, you will welcome the news that your larger motors can now have this same control. Order Bulletin 9586, Size 2, today from your nearby Cutler-Hammer Authorized Distributor. He is stocked and ready to serve you. CUTLER-HAMMER, Inc., 1306 St. Paul Ave., Milwaukee 1, Wisconsin.

CUTLER-HAMMER
★ ★ ★
MOTOR CONTROL
C-H



3-D Accessibility

Removing the wrap-around cover bares the entire starter for three-directional accessibility. It is wide open at front and both sides. You can see everything and reach anything. Wiring the starter is simplified and routine inspection is made so easy and complete nothing is ever neglected.

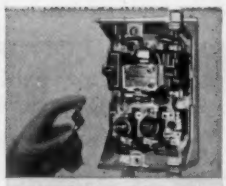


Unit Panel Construction

The entire starter mechanism can be removed from its case by simply loosening three screws. With mechanism out of the way, mounting case, connecting conduit and pulling wires is a cinch. A great time saver. No skinned knuckles. No damaged starter mechanisms.

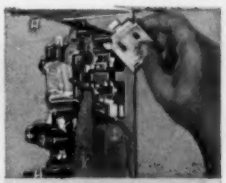
Full Three-Phase Protection

Only *three* overload relays can provide positive three-phase protection to stop needless motor burn-outs and production interruptions. And only Cutler-Hammer offers three overload relays in *standard* starters without the excessive costs and delays of special starter constructions.



Adjustable Sensing Coils

Only the accurate adjustment of overload protection permits motors to work harder without damage. Now more important than ever with newer type small frame motors. Only C-H offers adjustable load sensing coils . . . for 3% loading accuracy instead of the 10% to 12% in all other controls.

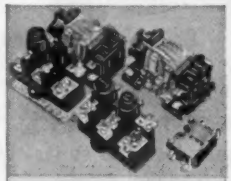


Superlife Vertical Contacts

Now the famous C-H dust-safe vertical contacts have been doubly improved. New light-weight design cuts bounce to reduce arcing. Also, arcing is now pressure-quenched. Contact maintenance care and costs are ended for all time in all normal motor control uses.

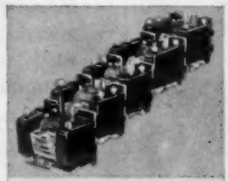
For Control Panel Designers

The new Cutler-Hammer ★★★ Motor Control offers an array of spectacular new features to provide many exclusive advantages in circuit planning, compact panel design, better motor protection and better control performance. Be sure you have complete design data on this advanced equipment. Write or wire today.



New Control Components

All parts of the new C-H ★★★ Starters in NEMA 0, 1 and 2 Sizes are available as components; also complete starters on convenient unit panels. Electrical interlocks are available to provide additional control circuits when desired.



New Control Relays

Finest of control relays. 10 and 15 Amp. 2-3-4-5-6 poles. All contacts instantly convertible from NO to NC or vice versa. NO or NC status seen at a glance without removing cover. New armored magnet coils color coded for voltage and frequency.

New SD & HD Pushbuttons

New standard duty pushbutton station with pilot light offers many exclusive features, typical of complete C-H line. Watch soon for announcement of the revolutionary new line of C-H heavy-duty oil-tight one-hole mounting pushbuttons.

All types of INDUSTRIAL Anaconda's 7 mills and net

POWER CABLE

Interlocked Armor—quick, easy, inexpensive to install. Easily relocated. Light, flexible.

DURASHEATH† all-purpose neoprene-jacketed cable can be run in the ground, in ducts, overhead in one *continuous run* without splices. Durasheath is also widely used as building wire.

DENSHEATH* for general power uses. PVC insulated. Resistant to flame, moisture, chemicals.

Varnished-cambric insulated for power, lighting and control uses.

Paper-lead for power in moderate and large blocks. 69,000 volts maximum rating.

GENERAL PURPOSE WIRE

Rubber insulated (Types R, RH, RH-RW, RW) for general purpose power and lighting.

Thermoplastic insulated (Type TW) with high resistance to moisture, corrosive fumes and chemicals.

DUTRAX* Type NM nonmetallic-sheathed cable for open or concealed wiring.

DURALL-T† Type UF and NMC cable for open or concealed wiring, inside or outside masonry block or tile walls, or underground feeder, subject to moisture, fumes, etc.

CONTROL CABLE

Supplied with PVC (DENSHEATH), polyethylene, rubber, and varnished-cambric insulation.

BUS DROP CABLE

POWERDUCT flexible cable increases use and mobility of machines; Underwriters' approved with rubber insulation and loom cover. Can be furnished with PVC jacket, flame-, moisture- and chemical-resistant.

PORTABLE CORDS

SECURITYFLEX† cord, 1/c to 8/c with special stranding and tough neoprene jacket. Takes abuse, won't kink, flexes indefinitely.

MACHINE TOOL WIRE

DENSHEATH PVC insulation, stranded conductors — flexible, easily worked, and will stand up against oils, greases, cutting compounds, abrasion.

SWITCHBOARD CABLE

Solid conductor with super-aging DENSHEATH PVC insulation.

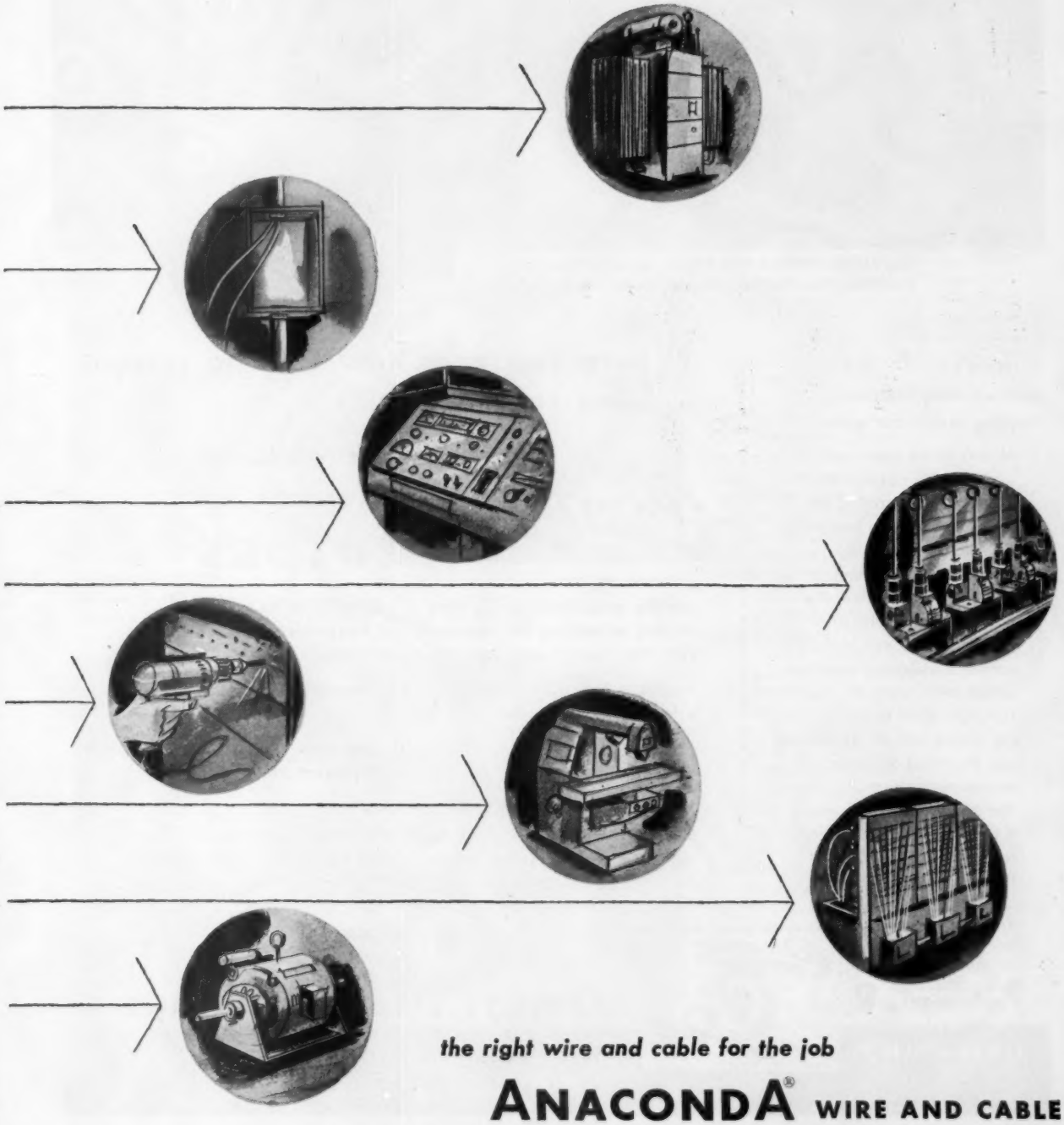
MAGNET WIRE

Anaconda produces a complete line of magnet wire . . . all types, sizes and shapes. Round, square, rectangular. CLASS A: *Formvar, Enamel, Nyform, Nylon.* CLASS B: *Vitrotex*, Silicone.* CLASS H: *Silotex*.*

*Reg. U. S. Pat. Off. †Trade Mark 54896 Rev.

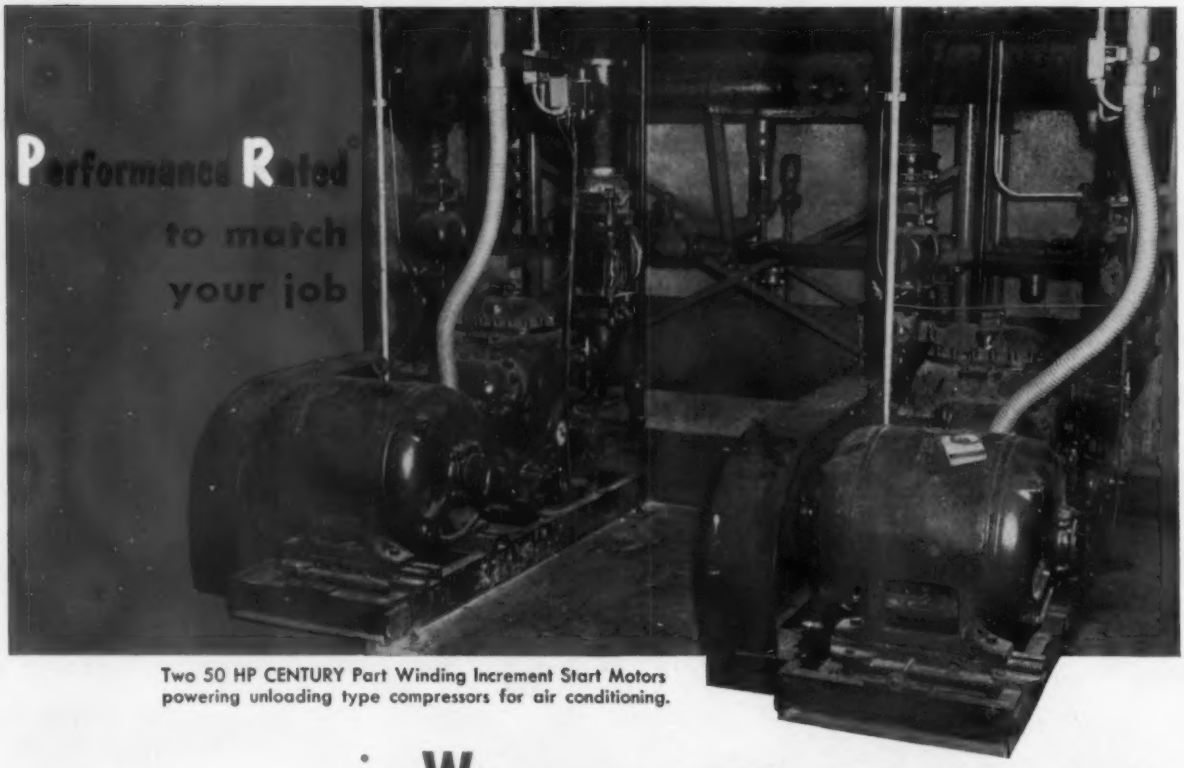
For more information call your nearest Anaconda Sales Office. *Anaconda Wire & Cable Co., 25 Broadway, New York 4, N. Y.*

WIRE and CABLE from work of wholesale outlets



the right wire and cable for the job

ANACONDA® WIRE AND CABLE



Two 50 HP CENTURY Part Winding Increment Start Motors powering unloading type compressors for air conditioning.

Here's how part winding increment starting works for you:

Motors of the increment starting type operate by electrically separating the motor winding into two parts. One half the winding operates when starting, delivering roughly half the normal starting torque, drawing about one half the normal starting current. After a few seconds the increment starting control connects the second half of the winding into the circuit delivering full torque and current.
The three step starter uses a series resistance to further reduce the current on the first step of the starter.

Where you need low starting current . . . you can save with

Century Part Winding Increment Start MOTORS

Starting large motors where there is a limitation on the amount of starting current may be done easily and inexpensively with CENTURY Part Winding Increment Start Motors and control.

Available from stock in all popular sizes, enclosures, and mountings. 1 to 400 HP polyphase.

- **Drip proof**
- **Splash proof**
- **Dust proof**
- **Explosion proof**

HORIZONTAL OR VERTICAL MOUNTING

Because all popular CENTURY Motors have provisions for part winding increment starting, they are available from stock in the complete Performance Rated Century line.

Write for Bulletin 14-157 P.1, or call your nearby Century Distributor or Century District Sales Office.

CENTURY ELECTRIC COMPANY

1806 Pine Street - St. Louis 3, Missouri

Offices and Stock Points in Principal Cities

© Performance Rated Century C MOTORS 1/8 to 400 H.P.

830

Motor Shops

Car Trailer Doubles as Sales and Advertising Aid

It pays to advertise your services and your wares, even in rural areas. Bob Shakstad, enterprising executive of Shakstad Electric and Machine Works, Sioux Falls, S. D., learned that the hard way. He toured the farm lands within about a 200-mile radius of Sioux Falls, calling on farm equipment distributors and farmers. He did this in his personal car carrying with him as many motors, motor parts and samples as the car trunk would hold. During his travels, he discovered two things: you have to make yourself and your firm name known; and you have to carry a substantial inventory of motors and accessories. Prospects in these areas are more apt to buy if you have the merchandise with you and can close a spot sale. Leave a catalog and order blank with them, with a promise to fill the order, and you are apt to lose the sale.

After completing a long circuit, Bob Shakstad returned to home base with a firm conviction that his sales could have been doubled or even tripled if he had had the motors and accessory equipment with him on his jaunt. Being sales and promotion minded, he decided to build a two-wheel trailer which he could tow with his own car.

The net result is a bright red, ¾-inch plywood trailer body mounted on disk wheels with shiny chrome hub caps and white-wall tires to match his two-tone red and white sedan. The trailer is 87 inches long, 76 inches wide, and 29 inches deep. An open center section, with a drop tail-board, runs the full length and is 37 inches wide and 27 inches deep. This is to carry bulky equipment, rewound motors or used motors either purchased or picked up for repair during the trip.

New motors, controls, connection cords, V-belts, parts and accessories are carried in 19-inch deep compartments in each side of the trailer. Each side has three compartments, two with shelves and full-length swinging doors and one (directly over the wheel) with a drop-panel.

Two dummy motors, bolted to the top of the trailer, advertise the main business of the Shakstad firm. White lettering on the front of the trailer body advertises the names of eight manufacturers whose products Shakstad handles. Lettering on each side advises the public that the firm buys and sells new and used motors and rewinds and repairs old ones; also that Shakstad does machine work and sells flexible couplings, V-belts, pulleys and motor controls. The back panel has the firm name and address and an announcement that it makes wholesale and retail sales.

Now, when Bob Shakstad leaves to make the rural circuit, his trailer is loaded with merchandise he is certain the farmer wants, and when he passes slowly through a town, he wears a satisfied smile. For his rear-vision mirror reflects the images of people on the sidewalk turning around to look at the natty trailer hitched to his car.

Does this sales and promotion scheme pay? Shakstad is convinced that it does. He rarely has any new merchandise left over for restocking after such a trip, and the proceeds frequently pay for more than trip expenses. When that occurs, the advertising feature is strictly a plus value. For Bob Shakstad knows that thousands of persons became aware of the Shakstad firm name and business identity as he made his rounds.

COLORFUL TRAILER attaches to sedan; has six locked compartments over wheels for new motors, controls and accessories; plus an open center deck for bulkier equipment. Owner Bob Shakstad shows storage space.

LARGE WHITE letters on red trailer body advertise firm name and business identity. Red and white pattern matches two-tone red and white color of sedan. All four sides of trailer are used to advantage to list firm's activities.

PIPE SLEEVES, capped on one end, are attached to a flange on the bottom of this dipping tank so that shafts of armatures being dipped can be recessed below the floor of the tank, thereby reducing varnish requirements to cover a given wound unit.

Pipe Extension Increases Capacity of Dipping Tank

In the shop of the Electric Motor Repair Company in Trenton, N. J., insulating varnish is greatly conserved and armatures of all sizes are conveniently dipped through the use of a 26-by-42-inch tank, on the bottom of which is welded a pipe flange for holding capped sleeves of various lengths. By this method, larger armatures may be dipped vertically, with the shaft sliding down below the bottom of the tank proper, into the capped pipe extension. When still larger armatures are handled with still longer shafts, the tank is merely drained, a longer capped pipe extension substituted for the one shown, the tank is blocked off the floor and then again filled with varnish to receive the larger unit.

This arrangement makes it possible to keep varnish levels just high enough to cover the windings, resulting in less mess, less varnish on hand, less evaporation and overall economy and efficiency in shop.

Shop-Made Coil Cutter, Stripper and Winder Are Precision Machines

Frank Gauvin, proprietor of the Electric Motor Service shop in Marlboro, Mass., finds that routines related to the rewinding and repair of rotating power equipment have been materially speeded through the use of several machines which were designed and constructed in his shop. Two of these machines—here illustrated with the backgrounds wiped out in order to emphasize construction details more plainly—were designed for (1) coil cutting and stripping, and (2) coil winding.

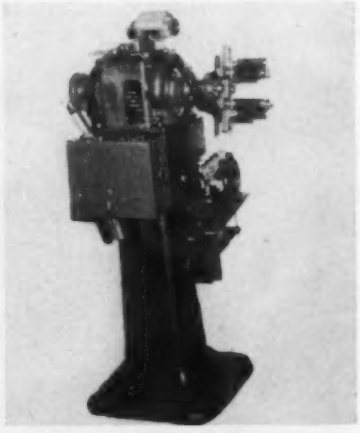
As indicated by the first photograph, the coil cutoff spindle (upper right) is an accurately engineered unit, with precision bearings installed at both the top and bottom of the spindle, and with an Oilite bearing at the upper part of the drill press. At the top of the unit may be seen a sliding V-pulley drive that rests on flat ball thrust bearings, while on the other side of the main mounting mast is mounted a ¾-hp 3-phase motor that has a speed of 3450 rpm and (due to difference in pulley diameters) drives the spindle at 4800 rpm.

The cutoff wheels (shown at the bottom of the vertical spindle) are nylon reinforced and, in operation, the spindle is lowered into the bore of the stator, then locked when the cutoff wheel is just below the bottom of the stator core.

As shown, the stator is supported on a large cast iron circular bearing plate (lower right) which can be revolved around the central stanchion and locked at any desired position. Clamps on the bearing plate are adjustable for both height and distance from the center of the table, thereby permitting various sizes of stators to be secured. With the stator thus secured, centered and positioned beneath the cutter spindle, the cutoff wheel is brought against the defective coils and the bearing plate is manually rotated to complete this operation.

With coil ends cut, the circular bearing plate is then revolved to the opposite side of the stanchion (as pictured), regulated so that the edge of the coil circumference is directly beneath the jaws of the coil puller. The flame of a gas torch is then directed on the coils until the varnish softens (usually from 2 to 5 minutes), the coil pulling tong is adjusted to a comfortable working height, and the coils are easily removed. As indicated, the coil pulling tongs are adjusted for height by

COIL CUTTING AND STRIPPING MACHINE, designed and built in the shop of the Electric Motor Service of Marlboro, Mass., can handle stators for all motors up to 15-hp size. Circular bearing plate, with adjustable stator clamps, can be revolved around central stanchion so that stator can be positioned beneath either the cutting spindle (right) or the pulling tongs (left).



COIL WINDING MACHINE has a capacity for winding small fractional fields as well as skeins for 25-hp units. Speed of transmission assembly is variable from zero to 550 rpm, with operation controlled by foot pedal. Counter can operate in either direction, adding or subtracting number of coil loops for constantly accurate count.

New

PROTECTION IN WIRE PULLING

RED THROAT

INDENTER No. BM 21 B

CONNECTOR FOR EMT

RED PLASTIC *Bushing* GREATLY INCREASES SAFETY *and* ECONOMY

NO INCREASE IN PRICE

"BM" Connectors—Original Indenter Type

Cat. No.	Size	Pounds Per 100	Carton Quantity	Standard Package
BM-21B	½"	7	50	500

Net Price per 100		
Less Carton	Carton Quantity	Standard Package
$ 9.40	$ 8.55	$ 7.80

- Wagner BM Fittings are approved by Underwriters' Laboratories as concrete tight and comply with Federal Specifications W-F-406.

The protruding locked-in red plastic bushing serves a three fold purpose:

(a) Insures a smooth, burr-free raceway for easy fishing.

(b) Eliminates possibility of damage to insulation during pulling.

(c) Protruding lip prevents mechanical damage to locknut thread.

TELESCOPE BM SYSTEM

UL

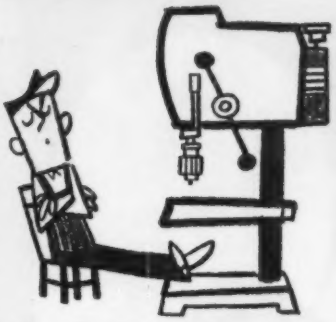
WAGNER MALLEABLE PRODUCTS CO.

General Sales Office: 222 W. Adams St., Chicago 6, Ill.

Foundry and Plant: Decatur 60, Ill.

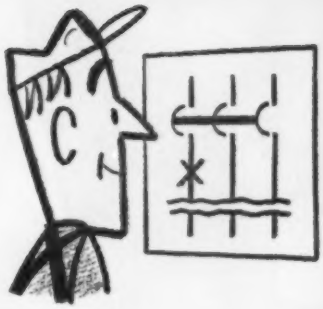
10 reasons why it's wise to buy

1 They offer the highest degree of personnel protection. Live parts are covered, even when enclosure cover is open.



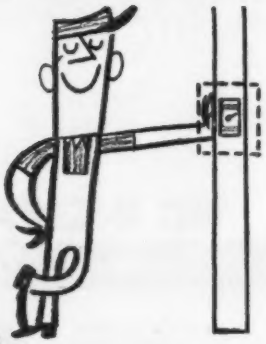
2 They reduce production downtime. No time is lost locating or replacing fuses. Breaker can be reset as soon as fault is cleared.

3 They eliminate replacement costs and maintenance. First cost is the last. No replacement parts or fuses are needed.

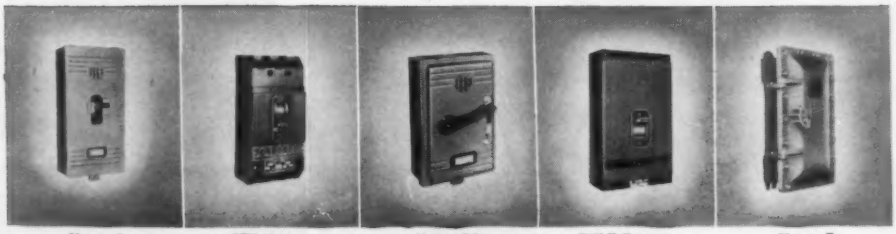


6 They prevent possible single phasing when a fault occurs. All poles trip simultaneously.

7 They safely carry continuous current rating indefinitely. Breakers must carry 100% of load indefinitely without exceeding temperature limits.



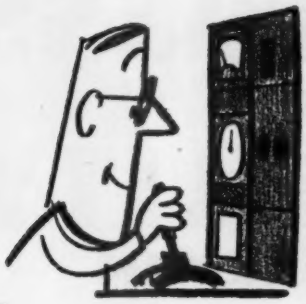
8 They save mounting space. Require less space than same rated enclosed fusible switch.



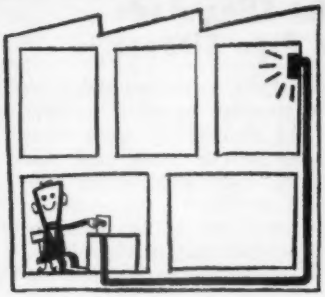
Nema 1 Enclosure | "F" Frame Breaker | Nema 1A Enclosure | "KL" Frame Breaker | Nema 7 Enclosure

I-T-E Circuit Breaker Protection

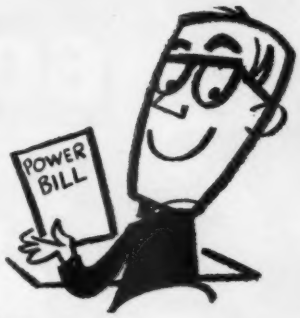
4 They are completely tamperproof. Breaker is calibrated and sealed at the factory.



5 They are twice-tested individually at the factory to insure uniformity of operation in the field.



9 They can be equipped with internally mounted auxiliary devices for undervoltage protection, remote tripping and indication of circuit condition.



10 They incur low watts loss. Welded connections and silver alloy contacts provide low watts loss throughout the life of the breaker.

I-T-E Molded Case Circuit Breakers are rated through 600 volts a-c, 250 volts d-c, 10 through 600 amp. I-T-E also supplies a complete line of enclosures for all applications. Contact your I-T-E representative or authorized distributor for the Speedfax Catalog. Or write Small Air Circuit Breaker Division, I-T-E Circuit Breaker Company, 19th and Hamilton Sts., Philadelphia 30, Pa.

I-T-E CIRCUIT BREAKER COMPANY • Small Air Circuit Breaker Division

NOW AVAILABLE

FROM NATION-WIDE WAREHOUSE STOCKS*

BIG CABLES

WITH THE SUPERB

TOUGHNESS

AND

FLEXIBILITY

FOUND ONLY IN

BRONCO

Certified **60**

Bronco 60 Certified Type W cables are made in all sizes from 8/2 to 1/4. They have a tough Neoprene jacket certified by a registered professional engineer to contain not less than 65.46% Neoprene. Made with coarse or fine stranding, Certified Type W possesses incomparable flexibility. The proof is in the product. Try Bronco 60 Certified Type W–you'll standardize with Certified.

Sold nationally only through Electrical Wholesale Distributors and manufactured by

WESTERN INSULATED WIRE CO.
Los Angeles 58, California

* *Warehouse Stocks Maintained in the Following Cities:* ATLANTA, GEORGIA • BALTIMORE, MARYLAND • BOSTON, MASSACHUSETTS • BUFFALO, NEW YORK • CHICAGO, ILLINOIS • DETROIT, MICHIGAN • KANSAS CITY, MISSOURI • LOS ANGELES, CALIFORNIA • LOUISVILLE, KENTUCKY • MINNEAPOLIS, MINNESOTA • NEW YORK, N. Y. • PHILADELPHIA, PENN. • SAN FRANCISCO, CALIFORNIA • SEATTLE, WASHINGTON

means of a rack and pinion arrangement.

This machine can handle all stators from fractional to 15-hp size.

The coil winding machine is constructed with a Graham variable-speed transmission serving as the winding head; the input speed being 1200 rpm (obtained through a belt-coupled ½-hp 3-phase motor), and the output speed of the transmission varying from zero to 550 rpm with an infinite number of stepless speeds within the range of the unit.

Driven by a chain and sprocket device is the turns counter, which may be reset to zero instantly by a lever, and which will operate in either direction (adding or subtracting) to give a constantly accurate count.

For fast stopping, the motor has a magnetic CH brake, while motor magnetic starter and drum reversing switch are mounted inside a junction box with the reversing switch control knob mounted on the box top. Control of the machine is by foot pedal, with a rubber-insulated connection to the starter.

This machine has a capacity for winding coils for motors ranging from fractional to 25-hp 3-phase assemblies.

Useful Sling Made from Pipe Sleeves

Heavy shafts, armatures and other equipments may be lifted quickly, easily and securely by using sling accessories such as those made and used by the Industrial Electric Company of York, Pa.

These items are in the nature of metal caps which may be slipped over the ends of the shaft to be lifted, and the hooks of a hoist sling are readily attached to the caps by slipping the hooks through steel bar lugs welded to the respective caps. Caps are formed from sections of 3-in. conduit, with

CAPPED PIPE SLEEVES with welded lugs attached are used to raise shafts and heavy armatures by means of hoist sling in Pennsylvania motor repair shop.

outer ends of these short sleeves closed by flat iron plates welded in place.

Use of these caps insures shafts from rotating or slipping while being lifted. Hooks and links of the chain hoist cannot mar the equipment being handled, and secure bearing is provided for the loads being raised.

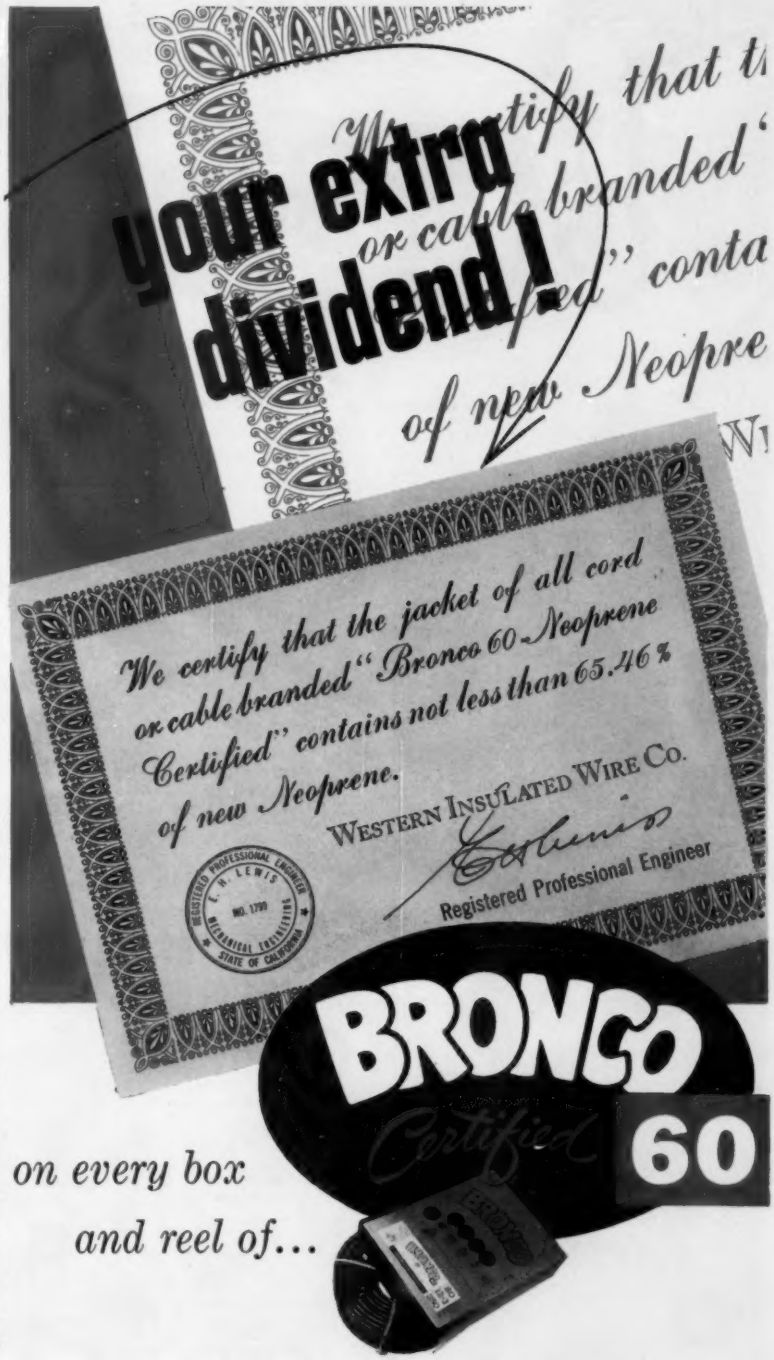
Burn-Out Dolly Has Concentric Gas Rings

Incineration of burned-out stator windings on a portable burn-out dolly simplifies stator stripping in the motor repair shop of Don Blackburn & Company in Detroit. Coil insulation is turned into ashes in a special cinder block enclosure, 5 feet square and 9 feet high, equipped with a blower motor and outside stack to exhaust combustion fumes. A cellular steel roof is topped with a four-inch layer of sand to meet Detroit Fire Department requirements. Similar roof construction is used on the spray and dip rooms in the vicinity.

The burn-out dolly consists of a double-tier grid constructed of angle-iron. The 37½-in. by 31½-in. frame rests on four metal casters and keeps the stator some 16 inches above floor level. The lower grid supports a four-ring gas burner connected to the main supply line by a length of heavy-duty flexible hose. The top grid, with its movable cross-pieces, supports stators of various frame diameters.

Size of the four concentric burner rings ranges from 5-in. diameter for the inner burner to 19½-in. diameter for the outer ring. Each has its own valve control so either one, two or all burners can be used as desired. Num-

CLEANING DEPARTMENT at Don Blackburn & Company shop consists of burn-out room on left and spray room at right. Both have cellular steel roofs with four-inch layer of sand as fireproofing. A transfer dolly stands in front of burn-out enclosure.


your extra dividend!
We certify that the jacket of all cord or cable branded "Bronco 60-Neoprene Certified" contains not less than 65.46% of new Neoprene.
WESTERN INSULATED WIRE CO.
Registered Professional Engineer
BRONCO
Certified
60
on every box and reel of...

This certification which appears on every box and reel of Bronco 60 Certified portable cable assures you that the protecting jacket contains *a bonus quantity of Neoprene...65.46%!* More Neoprene gives you greater oil-resistance, longer wear, more flexibility. No guesswork. No purchasing by faith alone. You *know* what you are getting. This certificate tells you *exactly* what...and how much. Be sure the wire you buy is *Certified*...and branded.

***BRONCO 60 CERTIFIED** is sold only through Electrical Wholesale Distributors and is manufactured by*

WESTERN INSULATED WIRE CO. • LOS ANGELES 58, CALIFORNIA

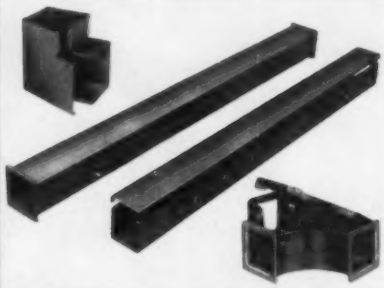
You can do a good job easier (and more profitably, too!) with the

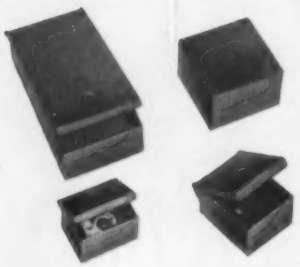
KEYSTONE QUALITY LINE

WIREWAYS AND FITTINGS · CUTOUT AND PULL BOXES
SWITCH BOXES · OUTLET BOXES · BAR HANGERS

Next time you're figuring a wiring job, specify "Keystone" all the way! You'll find the line includes most of the items you'll need for a neat, efficient, practical installation . . . all quality built, all competitively priced. All "job-engineered" to save you time, reduce your costs, increase your profits per job!

KEYSTONE WIREWAYS and Auxiliary Fittings have all the time-saving, money-saving features your customers want. They're quickly, easily installed, readily adaptable to any power distribution system. Available, too, in both flanged and flangeless styles and a wide range of sizes and lengths . . . from 2½" x 2½" x 1 ft. through 8" x 8" x 5 feet long.





KEYSTONE CUTOUT BOXES and Pull Boxes are furnished in Type "A" with hinged cover, Type "SC" with screw cover. Both feature a formed construction strongly fabricated and securely welded . . . with adequate, easily removable knockouts. And both types are available in a complete range of sizes . . . stocked for prompt delivery to meet your needs.

KEYSTONE SWITCH BOXES and Outlet Boxes are loaded with extra quality features! BX or Romex clamps are already assembled with nested fit for easy pulling of wires. Knockouts and pri-outs come out double quick. And tapped holes are extruded to provide extra thickness, eliminate stripping of threads. Even mounting brackets make installation easier.

New fact-filled, illustrated catalog presents the complete Keystone Quality Line . . . send for your free copy today!

KEYSTONE MANUFACTURING COMPANY

23328 SHERWOOD AVENUE • CENTER LINE (Detroit) MICHIGAN

It pays to figure on Keystone

. . . the Complete Line of Wiring Installation Equipment
Sold Only through recognized Electrical Distributors

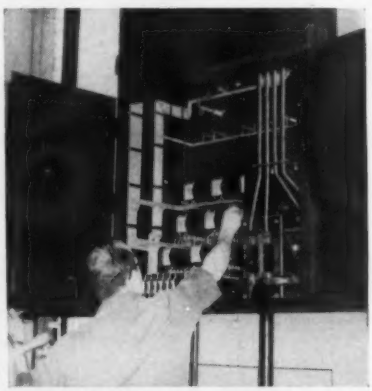
ber of burners in use at one time depends upon the size of stator being incinerated. Maximum weight capacity of the dolly is one ton.

To set up for burn-out, the dolly is pulled to the front of the enclosure. The stator is set on the top grid, with the cross-pieces adjusted accordingly. After the necessary number of burner rings are lit, the dolly is pushed back into the enclosure and remains there until the coil insulation is reduced to ash. The dolly is then pulled to the front of the burn-out room and the stator transferred to a stripping table where the bare copper coils are removed. Shop superintendent Ed Burke, who designed the incineration system, finds this method both effective and efficient on most of the work coming into the Blackburn shop.

Rear Access Doors for Test Panels

When repairs or adjustments were formerly necessary on the rear test panels of the Berks Engineering Company, Reading, Pa., it was only possible by removing and reversing the panels for that operation. For that reason, both the ac and dc test panels are now mounted in false walls, with a full-width pull box above, supporting flanged pipes below, and bi-parting access doors at the rear of units. By opening these rear doors, wiring, adjustments, maintenance and repair operations can now be carried out without disturbing the panel fronts in any way.

Herbert Schmeyl, foreman of the Berks shop, says, "We can get into the rear of the testing panels with no trouble. Before we set them into false walls we practically had to tear down the entire front to make repairs."



ADJUSTMENTS, maintenance, repairs and rewiring can be completed on test panels by locating panels in false walls and equipping them with rear access doors.

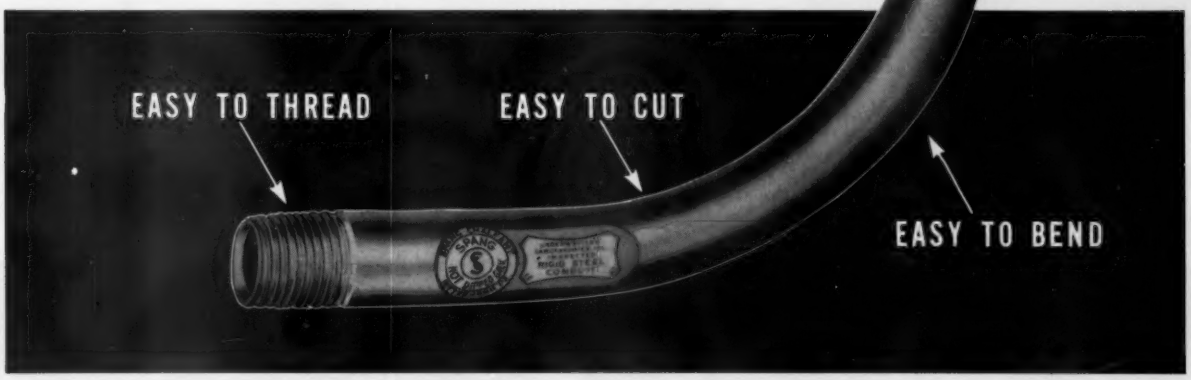
Here's SPANG®

Quality Control at work... for you!

These dials, gages and recorded graphs are the story behind SPANG *quality control*. Located beside the heating furnace, they automatically control the furnace heat zones at pre-determined temperatures as *top-quality* skelp is heated prior to the forming and welding of SPANG Conduit.

It's the right combination of controlled gas and pre-heated air entering the various sections of the furnace that produces *top-quality* SPANG Conduit.

and here are the results of Quality Control...



Add to this the fact that each length of SPANG Conduit is especially processed to give it a fine, corrosion-resistant finish . . . is thoroughly tested and inspected to give you a *top-quality* product . . . and you have the complete SPANG *quality-control* story. These quality features make SPANG Conduit easy to work with on the job . . . save you time . . . save you money on installations.

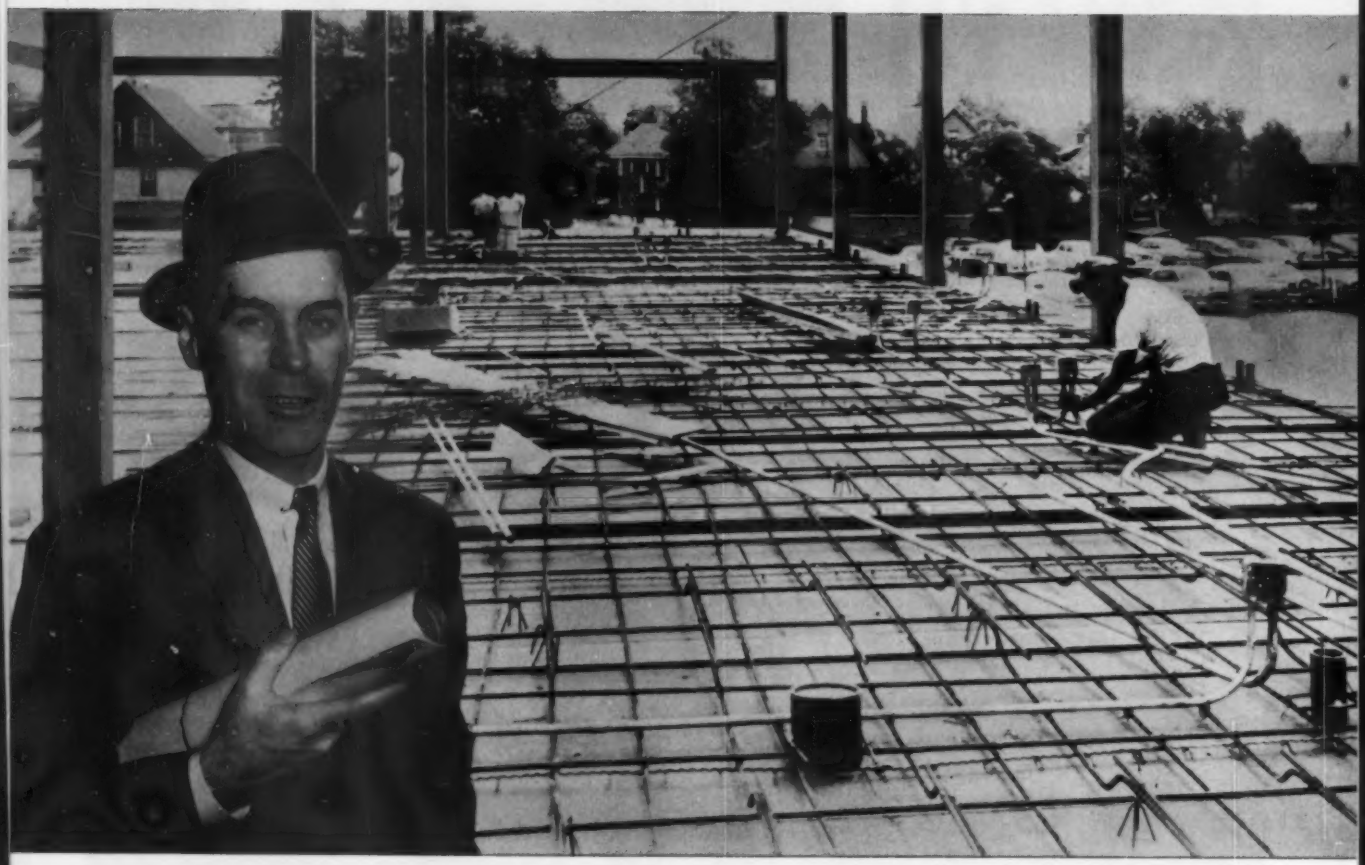
All this means that SPANG Conduit is tops for protecting wiring in all types of electrical installations. You get this *top-quality* in both SPANG Hot-Dipped Galvanized Conduit or in SPANG Black Conduit. Your nearby SPANG Distributor has a complete line of all SPANG Conduit and Fittings. Let him serve you!

SPANG® CONDUIT

SPANG-CHALFANT
Division of The National Supply Company
GENERAL SALES OFFICE:
TWO GATEWAY CENTER, PITTSBURGH, PA.
District Offices and Sales Representatives in Principal Cities

Improved performance during and after installation explains . . .

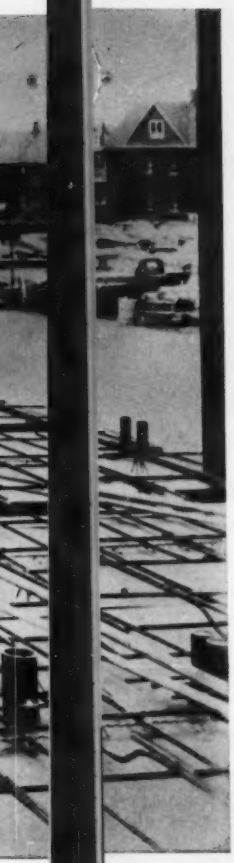
WHY CONTRACTORS PREFER



2 G-E White is easier to thread. The zinc coating produced by metallizing acts as an ideal cutting lubricant, simplifies threading operations at the job site, produces cleaner threads, and increases threading tool life.

3 The galvanized threads on G-E White, plus the smooth, even threads that can be produced "on the spot," provide exceptional ease of coupling . . . speed the whole installation job.

G-E WHITE



You'll quickly notice a difference in installation time, workmanship, and ease of installation on your next wiring job if you select G-E WHITE galvanized rigid steel conduit. New G-E WHITE offers easier bending, threading, and wire pulling. It has galvanized threads and new corrosion-resistant coatings inside and out which add years and years of service life. It's listed by Underwriters' Laboratories, Inc. and conforms with ASA and Federal Specifications. Ask your General Electric distributor about G-E WHITE rigid conduit or write to Section C50-218, Construction Materials Division, General Electric Company, Bridgeport 2, Connecticut.

1 New G-E White is easy to bend. It is galvanized by metallizing, which bonds a uniform coating of pure zinc to the conduit's entire outside surface. Metallizing eliminates the excessive heat, quenching, and straightening used in other galvanizing processes. The result is much better ductility. The finished bend (below) is round and full, with practically no flattening.

4 It's easier to fish and pull wire through G-E White. This conduit has a new, tough, corrosion-resistant inside coating that contains a special antifriction agent. Wires slide easily . . . and swiftly . . . over this smooth inside surface.

Progress Is Our Most Important Product

GENERAL ELECTRIC

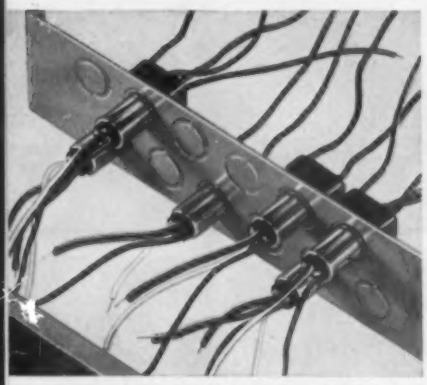
"Wiring 700 Broadmoor Homes proved to us that G-E REMOTE-CONTROL WIRING is easy and economical to install"

Says EARL L. FEWELL, *Partner*
Price & Fewell Electric Co., Little Rock, Arkansas

Price & Fewell installs switching circuits with stapling gun.

"When you've completed 700 G-E remote-control installations, as we have, and find that it adds surprisingly little to your costs, it's easy to see that you can't afford to miss this chance for extra profits." Mr. Fewell then goes on to say, "We find that we can easily sell up a contract by offering remote-control and, at the same time, pass on extra satisfaction and convenience to our customers."

If you would like to know why Price & Fewell finds this modern wiring system easier and more profitable to install, and how you can offer its conveniences to your own customers at little extra cost to you—do this today! Write for your free copy of the new "G-E Remote-control Manual for Residential Wiring Design and Installation," Wiring Device Department, General Electric Company, 50 Hathaway St., Providence 7, Rhode Island.



REMOVABLE DIVIDER in new RGB boxes simplifies ganging up to twelve relays for zone grouping. Relays operate on 24 volts; pigtails are color coded.

WALL SWITCHES (shown above) control individual circuits. . . . Selector switches control up to 9 circuits. . . . New circuit servants control up to 25 circuits.

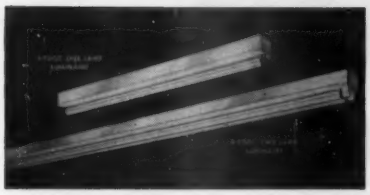
HOW REMOTE-CONTROL WORKS . . . components . . . system design . . . planning and ordering . . . installation. All are explained in G.E.'s new 36-page manual. Write for it today!

Progress Is Our Most Important Product

REWIRE AMERICA
WITH GENERAL ELECTRIC WIRING SYSTEMS

GENERAL ELECTRIC

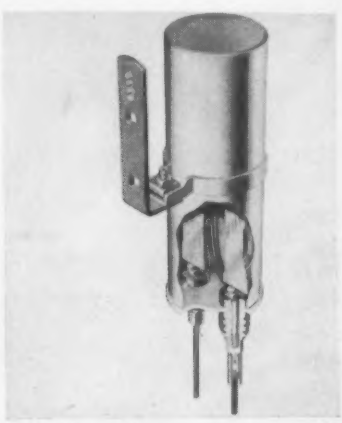
Product News



Lighting Units (1)

Series of commercial luminaires called the "Multi-Lite" series has been engineered to provide low-cost lighting suitable for any lighting problem. They are available in 1- or 2-lamp units either as open-lamp fixtures or with three different types of shielding—louver shielding for corrider lighting, asymmetric shielding for stock bin lighting or symmetric shielding for all purpose lighting. Shielding is available for 1-lamp, 4-, 8- and 16-foot units. Additional open-lamp units may be had in lengths of 2, 5 and 10 feet. Lamp models available are T-12, 20-watt medium bi-pin, T-12 40-watt medium bi-pin, 38-watt slimline, T-17 85-watt Krypton, T-17 40-watt low brightness (available only for 1-lamp, 5-ft units), 75-watt slimline, and T-12 40-watt rapid start. Luminaires may be mounted flush or suspended individually or in continuous rows. Operate on 110-125 volts, 60 cycle ac.

Mitchell Manufacturing Co., 2525 N. Clybourn Ave., Chicago, Ill.



Power Capacitor (2)

A new 5-kvar, single phase, 240-volt power capacitor (Type FPS) for secondary distribution circuits. Improved design provides for mounting the power capacitor with terminals either up or down. Each capacitor is supplied with a steel bracket for direct pole mounting. An adapter converts the pole bracket into a standard EEI-NEMA cross-arm bracket. Terminal-mounted fuses that are coordinated with the power capacitor ratings are now available. Aluminum case construction provides permanent protection against atmospheric corrosion. Two insulated leads 48 inches long are supplied with each capacitor to permit easy connection to residential feeders.

Westinghouse Electric Corporation, P. O. Box 2099, Pittsbugh 30, Pa.

Portable Pipe Machine (3)

A new portable pipe and bolt threading machine, called the No. 552 "Pipe Master", will ream, thread and cut-off all sizes of pipe from ⅛-in. to 2-in. and will drive geared die-stocks and cutters up to 12 in., through a special drive shaft. The machine weighs 265 lbs., is 39½-in. long, 17½-in. wide and 17¼-in. high. It has a ½ hp. universal, geared-head variable speed motor. Spindle speeds are automatically variable with load—22 to 36. It is equipped with floating-type, adjustable die-hard and a wrenchless front chuck.

Oster Mfg. Co., 2057 East 61st Place, Cleveland 3, Ohio

Varnish (4)

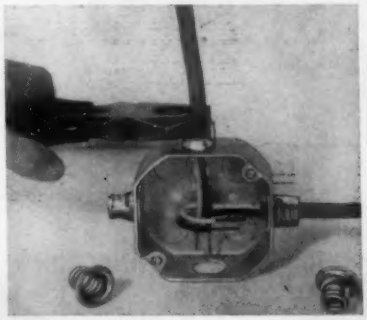
A modified silicone dipping and impregnating varnish which substantially increases the durability of electrical equipment insulated with Class B components. Identified as Sylkyd 1400 Varnish, it combines heat stability with bond strength and resistance to moisture, oil and solvents. It has an insulating life expectancy of 25 to 50 times that of good organic varnishes at the Class B hottest temperature of 130 C. Not intended for use at Class H temperatures, it will stand up at temperatures in the range of 180 to 200 C for short periods. Sylkyd 1400 is particularly adaptable to railroad traction motors and other heavy duty equipment which carry frequent overloads and must be cleaned periodically for inspection and performance checking.

Dow Corning Corporation, Midland, Mich.

Ventilating Hood (5)

A new kitchen ventilating hood, Model 239, tilts for cleaning. Two thumb screws turn to lower the entire hood, and the unit can be lifted off for cleaning outdoors. Unit is constructed with built-in three-speed fan switch and light switch. Fan and light are in a section below the bottom shelf, to conserve cabinet space. Exhaust duct may go inside wall behind range. Installed under cabinets, over the kitchen range, the hood combines the Blofan exhaust ventilator and Pry-Lite, the 100-watt recessed light fixture. Hoods for 30-, 36-, 39-, 42- and 48-in. cabinets come in coppertone, baked white and stainless steel.

Pryne & Co., Inc., 142 No. Towne Ave., Pomona, Calif.



Connector (6)

A new low-cost connector that speeds the installation of non-metallic sheathed cables in junction boxes. Named the Fast-On connector, Type No. 2, it is made of a special rustproof aluminum alloy and is listed by Underwriters' Laboratories, Inc. It fits 14-2, 14-3, 12-2, 12-3, 10-2, 10-3 and other wire sizes. To install, connector is inserted in box, wire is then inserted through connector and connector is crimped tightly onto wire with regular electrician's pliers. The crimping automatically locks wire, connector and box together. Unit fits flush inside the box. Literature is available.

Denman Products Co., 210 Bietz Bldg., Ravenna, Ohio

45° ANGLE CONNECTOR

NEW midwest ANGLE CONNECTORS

APPLICATION

45° and 90° angle connectors for non-metallic cable, armored cable, flexible steel conduit. Connectors are two-screw, hinged cap; are designed for neat and quicker installations for O.E.M. as well as regular trade applications.

★ ENGINEERING

These fittings are designed with a screw on each side of the opening to provide a secure grip on the cable. Screws are of sufficient length to permit cable to be installed without removing cap.

MATERIAL

Connectors are made with a malleable iron body, formed steel cap and locknut; thoroughly cadmium plated for protection against corrosion.

SIZE

Connectors are standard trade size 3/8", for 1/2" threaded hub or knockout. Minimum and maximum openings for cable are 3/8" and 21/32".

90° ANGLE CONNECTOR

Here is another Midwest development in providing quality fittings. "Quality" is just a condensed way of saying: "Getting the total job done—right—with the most inexpensive combination of material and man hours." Engineering and producing quality fittings to meet the highest standards of electrical wiring installations, is our objective at Midwest.

Midwest Electric Mfg. Company

MANUFACTURERS OF ELECTRICAL WIRING PRODUCTS

1639 W. WALNUT STREET
Chicago 12, Illinois

Solderless Terminals (7)

A new line of solderless terminals called "The Bucklug". Designed to gain the maximum advantage of the exclusive Tri-Dent crimping action of the Buck Nycapper, the Bucklug itself further assures perfect wire termination. The vertical offset of the tongue provides for easy position in the Nycapper crimping tool. Uniform location of crimp is accomplished regardless of barrel size or tongue shape. They are available in two basic sizes covering a wire range from No. 18 to No. 10 solid or stranded. A choice of four tongue styles; ring, spade, locking spade and hook tongues, each made for three different stud sizes is provided. All of the 24 sizes and types are made of heavy copper, hot electro tin plated.

Buck Electrical Manufacturing Co., P. O. Box 147, Roselle, N. J.

Tension Wire Stringer (8)

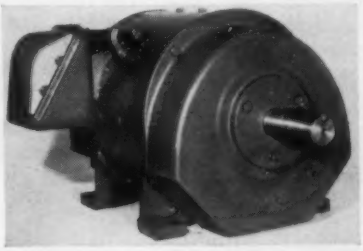
Model 5000 Pengo tension wire stringer for stringing overhead power line conductors under tension, takes reels up to 69-in. in diameter; and any conductor to 556MCM ACSR. The reels are placed in a cradle of hard rubber tire rollers, which are provided with brakes sufficient to keep the conductor from becoming slack between the reel and the first bull wheel. The conductor follows the multigrooves on the aluminum bull wheels which are Neoprene lined. After the proper number of turns around the two bull wheels the conductor pays out to the overhead line under tension. Both bull wheels are provided with standard disc brakes. The brakes are controlled separately by a hand crank device. Model 5000 4-reel unit fits on most standard trucks or trailers. It is 7-ft 4-in. wide. Model 5000 is for all size conductors up to 556MCM and Model 6000 is designed for all other sizes up to 964 MCM.

Petersen Engineering Co., Santa Clara, Calif.

Fuse (9)

A dual-element Saf-T-Lag fuse for use in home wiring systems has been added to this line. Fuse will permit the appliances to start and provide proper protection to the household circuits. The dual-elements in Saf-T-Lag fuse allows a time delay of a few seconds, and still handle any heavy short circuit.

Jefferson Electric Company, Bellwood, Ill.



Motors (10)

A new line of industrial direct-current motors, known as the Super "T" line motors. Dynamic Response has been built into the new motors. Some of the features of design are ruggedness, ability to take full load and overloads, ability to change speed rapidly, ability to maintain torque and tension, and reverse and stop quickly. Lower mechanical inertia, lower electrical inertia and higher commutating ability have been combined to achieve a new high in motor performance. They are produced in sizes from 20 to 100 hp, and range will be extended both upward and downward to higher and lower horsepowers. A complete range of mechanical enclosures has been developed.

Reliance Electric and Engineering Co., 1088 Ivanhoe Road, Cleveland 10, Ohio

Connector (11)

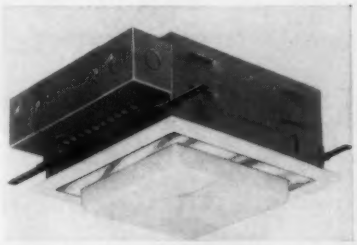
Red Throat B-M 21 Bx is a new insulated throat indenter type connector for thin wall tubing. It has a permanent locked in red plastic bushing that not only covers the entire inside area of the throat but also insures a smooth burr-free raceway for easy fishing. Smooth rounded lip of red plastic bushing protrudes lightly beyond the threads of connector which not only protects threads from damage due to impact but also eliminates short and grounds caused by wear in wire insulation due to vibration where wires leave raceway. It is U. L. approved as concrete-tight.

Briegel Method Tool Co., Galva, Ill.

Watt-Hour Meter (12)

A new extended-range watthour meter, featuring a capacity of 100 amps, is designated the I-55. It will retain such features as a magnetically-suspended rotor; unit construction, coordinated insulation, corrosion-resistant materials, plus a unique retarding system. It is capable of handling loads up to 667% of nameplate rating. Among the changes found in the I-55 are a current coil equipped with heavier copper windings, and brazed terminal lead which provide 100-amp capacity with a normal temperature rise of 55 degrees C. Ground pins have been relocated under current leads in order to maintain the desired relief-gap distances, while Buna-N rubber gaskets provide proper fitting covers.

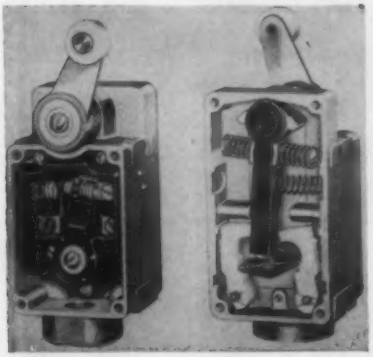
General Electric Co., Schenectady 5, N. Y.



Incandescent Lighting (13)

A new recessed incandescent lighting series has been introduced. Available in square and rectangular styles, the units are prewired. Sizes range from 60 to 300 watts and there are a variety of lenses in the line: cast opal glass bowl, Fresnel lens, semi-flushed dropped lens, and Corning Alba-Lite and Fota-Lite. Unit features a newly designed Duraflux reflector, fabricated from a single piece of aluminum. Another feature is the invisibly hinged corrosion-proof stainless steel lens frame which opens at a touch by the finger to the vibration proof spring latch. Large wiring compartment is accessible from both the exterior and interior of fixture, and cooling system. Fixtures are Underwriter's Laboratories approved for use with lowest cost building wire direct to the wiring compartment. Architectural Bulletin 555F is available.

Litecraft Manufacturing Co., 8 East 36th St., New York, N. Y.



Limit Switch (14)

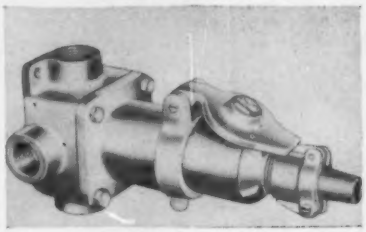
A new heavy-duty machine limit switch, Type DM, features increased wiring space, protection against excessive overtravel achieved without shear pins, complete separation of electrical and mechanical mechanisms, and nylon-to-steel wearing surfaces. Switch is rated at 10 amps continuous capacity up to 600 volts ac, 550 volts dc. Switch is available with ½- or ¾-in. conduit connections. Space has been provided for four No. 12 wires. Insulated connectors may be used, but multi-level terminals are provided to permit use of uninsulated pressure-type connectors. A variety of front and reverse-lever mounting arrangements can be made with six optional back cover plates. Eight types of operating levers are available, including four lengths of straight levers, and track-type, planer-type, and shipper rod arms.

Clark Controller Company, 1146 *East* 152d *St., Cleveland* 10, *Ohio.*

Electronic Ovens (15)

Two commercial models of the Raytheon Radarange microwave oven are in production. Both are single-package systems housed in stainless steel cabinets. The larger of the two, Model 1161, measures 26 by 26 by 64½ inches and provides a heating chamber which is 20 by 12 by 22 inches. Model 1170 is a counter unit, 23 by 21 by 29¾ inches, with an oven which is 14 by 10 by 18 inches. Heating is by microwave energy at 2450 megacycles, which is generated by QK-390 continuous-wave, air-cooled magnetrons. Ovens are designed to operate on 208 to 230 volts, single phase, 60 cycles. The neutral wire carries no current and can be used for grounding. The conversion from 208 to 230 volts is made by changing a transformer tap within the range. The large model consumes about 1.02 kw on standby and about 5.3 kw on high heat, with a power factor of approximately 85%. The power demand for the small model is just half that of the large range.

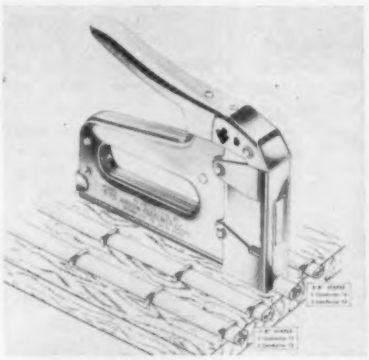
Raytheon Manufacturing Co., Waltham 54, *Mass.*



Plugs and Receptacles (16)

New Kilarc explosion-proof plugs and receptacles have been added to this line. Designed for safety in the electrical connection of portable equipment. Features are non-sparking; lightweight; rust and corrosion proof. They are available in many styles and sizes to fit various boxes. Made in 15-, 30-, 60-, 100-amp (100-amp weatherproof). Approved by Underwriters Laboratories.

Killark Electric Mfg. Co., Vandeventer and Easton Aves., St. Louis 13, *Mo.*



Staple Tacker (17)

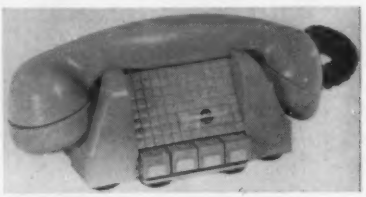
Arrow T-75 gun tacker staple machine has been developed especially to fasten UF cable, branch circuit wire, wire conduit, plastic cable, water tubing, low voltage wire, non-metallic sheathed cable and other types of insulated wire. They are equipped with compression springs and operate on the principle of "double-leverage". The self-feeding, automatic action of the tacker permits user to staple-tack at the rate of speed desired. New safety device is the built-in groove guide at base of tacker, especially designed to envelope electrical wires and cables. The driven staple will not split wood and cannot damage wire or cable for staple saddle wraps over it.

Arrow Fastener Company, Inc., 1 *Junius St., Brooklyn, N. Y.*

Transformer (18)

A new lightweight 167-kva single-phase distribution transformer. It is available in all standard primary voltage ratings through 13,800 volts. It may be pole mounted. The new obround tank design is a contributing factor to the improved physical characteristics. The new transformer retains the desirable performance features of uniformly high impulse level, low exciting current, high short-circuit strength, and short-time overload capacity available in Round-Wound transformers. All single-phase transformers, 5 through 100 kva, will be redesigned to incorporate the advantages offered by the obround tank. These units will be available as each design size is completed.

Line Material Co., 700 *W. Michigan St., Milwaukee* 1, *Wis.*



Telephone Hook Switch (19)

Magnetic telephone hook switch has been designed and incorporated in the Connecticut Direct-A-Call, a new intercom telephone. The magnetic hook switch, using a Carboloy alnico 5 magnet, was designed to make the Direct-A-Call telephone adaptable for wall or desk mounting. Housing is completely enclosed. Carboloy alnico 5 magnet has been inserted in the telephone handset. The Direct-A-Call system has been designed to handle any intercommunication requirements up to 10 stations. Two-way loud speaking stations also may be incorporated into the system for use in stock rooms, warehouses, production departments or other places where workers' hands are too busy to pick up a telephone. Signaling from one station to another is accomplished by means of direct signaling pushbuttons.

Connecticut Telephone & Electric Corp., Meriden, Conn.

WESTINGHOUSE
DISTRIBUTOR REPORT

Here's how you can show management ways to cut costs now

Now's the time, all right . . . time you can turn a "breather" into a real opportunity.

Breather? We mean the more normal production schedules today, compared with the frantic, all-out pace followed over the past few years.

And you can use it to advantage.

You can show management how it enables them to make badly needed change-overs, with less interference to operations than before. You can show how lighter machine schedules and less crowded shop conditions mean that partial shutdowns for replacement can be made more easily, more economically.

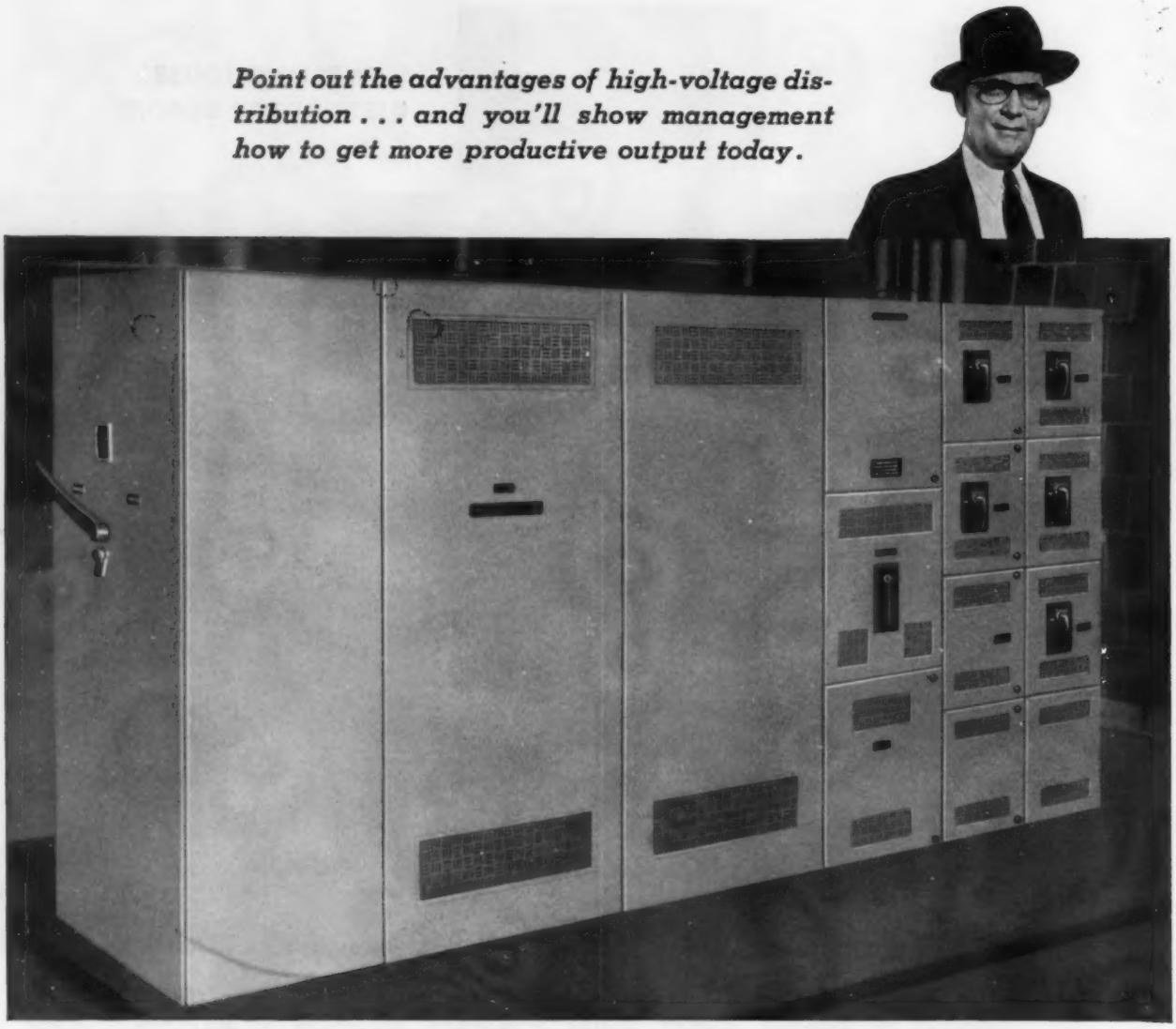
And you can show how modern electrical equipment means better, lower cost production *today* . . . when costs are really tight. DP-5009-A

The next seven pages help you show why . . .

YOU CAN BE **SURE**... IF IT'S

Westinghouse

Point out the advantages of high-voltage distribution . . . and you'll show management how to get more productive output today.



Carry high voltage close to loads with dry-type power centers

Long, low-voltage feeders—a costly practice still followed by many plants—can be eliminated with Westinghouse dry-type power centers.

Combining transformers and circuit protecting equipment in a single enclosure, they permit high voltage to be carried close to the center of the load. Result: reduced line losses; improved voltage conditions—lowering operating costs and stepping up efficiency of motor drives and plant lighting.

Further, Westinghouse dry-type power centers eliminate the need for separate vaults . . . the expense of storing or replacing oil. And they are inherently flexible. New feeders can be added easily as power requirements grow. DP-5009-B

And the features of Westinghouse bus duct mean this to management: flexibility today to easily handle production line changes tomorrow . . .

YOU CAN BE SURE...IF IT'S

Flexibility of plug-in bus duct solves changing load requirements

The frequent rearrangements and additions modern industry makes in its production lines are readily handled with Westinghouse plug-in bus duct.

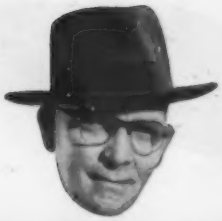
By providing power availability at one-foot intervals, it enables relocated or new machines to be tied-in quickly, with a minimum loss of production time. And power take-offs are easy. Merely slide cover away from plug-in receptacle. Then, plug in and fasten unit to duct.

Westinghouse plug-in bus duct is prefabricated. It installs easily with cantilever or "C" clamp hangers, adapts to any layout and is completely salvageable . . . can be dismantled, reassembled, expanded.

Comes in four types to meet any distribution need. Also available with aluminum bus bars.

DP-5009-C

Westinghouse



Spell out better seeing conditions through planned lighting . . . and you'll show how to maintain better quality control now.

New ventilated high bays in the rear of this plant graphically show higher illumination levels. Compare these with older units in foreground. DP-5009-D

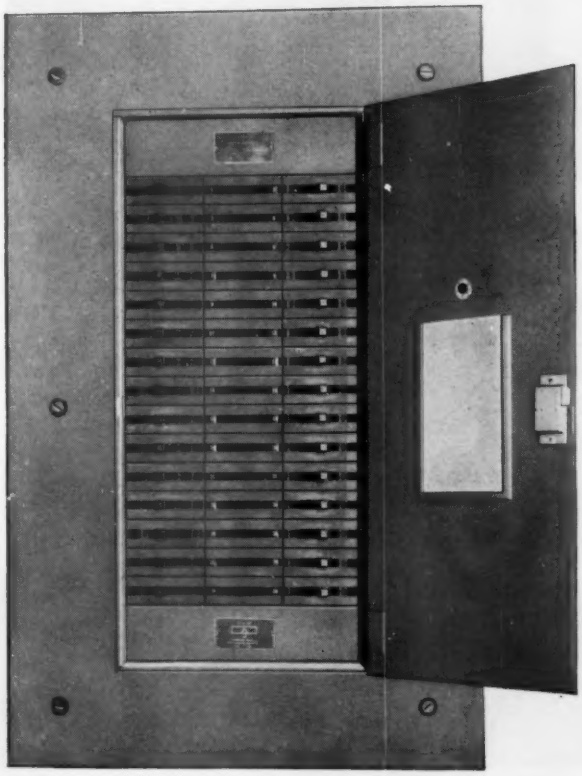
Ventilated mercury high-bay fixtures mean more light, less maintenance

Mercury lighting and Westinghouse ventilated high-bay fixtures bring these immediate benefits to the production area: increased illumination and lower maintenance costs.

The Westinghouse high-bay fixtures have an opening between the neck and reflector. This provides a constant air stream that sweeps the entire reflector surface clean. Less manual cleaning is needed; lighting efficiency is maintained over a longer period—extremely practical advantages when over-all economy is considered.

In addition, these new ventilated high-bay luminaires last longer since the reflector and extension neck are separately spun pieces. The ventilating system is not a part of the extension or reflector. This means *no weak spots.* There's no punching of holes to weaken the structure in critical areas. This means *longer life.*

Protect modern lighting installations with circuit breaker panelboards



A single lighting outage adds up to a double cost. There's the labor and materials cost—necessary to restore service. And there's the cost of production down time—the loss of man and machine hours.

Both can be virtually eliminated with Westinghouse circuit breaker panelboards. Their AB "De-ion®" circuit breakers won't trip on harmless overloads . . . yet, permit quick restoration of service when circuit interruptions occur. A flip of the breaker handle restores service instantly and safely. No need to call a maintenance man or electrician. No fuses to store. No chance of over or under fusing. DP-5009-E

Type NH1B Lighting Panelboard—for 277/480-volt, 3-phase, 4-wire lighting circuits. Made up of "E" frame breakers. "De-ion" arc extinction plus thermal and magnetic tripping devices gives maximum protection.

YOU CAN BE SURE...IF IT'S Westinghouse

Cover off the importance of backing production equipment with modern drives . . . and you'll show how to bring about immediate operating economies.

Meet demand for operating economy with better protected Life-Line "A" motors

The drives *behind* production equipment can spell the difference between reasonable and excessive operating costs. That's why the new Westinghouse Life-Line® "A" motor is a basic consideration.

Here's a power package guaranteeing better performance . . . a better protected motor that's smaller, yet stronger and electrically longer lasting than *any* conventional motor on the market today. Here are the advantages found only in Life-Line "A":

1. **New 4-way seal, pre-lubricated bearing.** Needs no lubrication; protects against under or over greasing and entry of foreign matter . . . resulting in longer motor life.
2. **New Bondar conductor insulation.** Means more resistance to heat and contaminants . . . longer motor life.
3. **New Bondite stator insulation.** An impregnating varnish fortified with silicone which resists water, vapor and chemical fumes. This means dependable operation under any atmospheric conditions.
4. **New Mylar* slot insulation.** Greater dielectric and mechanical strength which means fewer motor failures. DP-5009-F

*Du Pont registered trade-mark.

Modern circuit protective devices assure better production efficiency

Lost production time. Heavy maintenance costs. You'll cut these by recommending modern circuit protective devices shown here. Have management consider:

AB-1 Circuit Breakers. They provide complete protection against short circuits and high overloads . . . literally paying for themselves in many cases by eliminating *unnecessary* down time.

The Westinghouse "De-ion" circuit breaker measures both time and current . . . trips only on dangerous overloads that could damage production equipment. And when power is interrupted, service is restored quickly and safely. A flip of the circuit breaker handle does it.

There are no fuses to replace, nothing to wear out, practically no maintenance of any kind.

Safety Switches. A complete, high-quality line to meet your requirements when managements request fusible protective devices. The new Type "H", for example, is now ready for heavy-duty industrial applications.

It provides a NEMA-1A dust-resisting enclosure with an interlocked cover that cannot be opened when switch is in the "ON" position. Too, line terminals are covered by a Micarta® shield—minimizing exposure to live parts when inspections or fuse replacements are made. DP-5009-G

YOU CAN BE SURE...IF IT'S Westinghouse

A one-stop apparatus source for your modernization needs

The Westinghouse distributor in your locality is equipped to serve all your apparatus requirements.

From centrally located warehouses he can supply, complete from stock, full product lines—matched Westinghouse equipment recognized for their simplified and standardized design. This means easier installations . . . gets you on and off the job quickly.

Additionally, the Westinghouse distributor in your area offers you the services of Westinghouse headquarters engineers . . . product and application specialists who are closely identified with the construction industry. Operating on a team basis, they are readily available . . . when and where you need them . . . to help you handle many of your electrical problems.

One call to your Westinghouse distributor puts this combination of product and engineering services to work for you. Get in touch with him for a survey of your electrical needs. DP-5009-H

YOU CAN BE SURE...IF IT'S Westinghouse

Heating Control (20)

A new "remote" outside bulb weather man heating control. The regulator case is installed indoors. Heat is controlled by a program dial which automatically controls heat input during the day, provides night set-back and a morning buildup period—all adjusting according to the changes in the weather. A feature of this heating control is a manual "Variator" dial that can be positioned to variably increase or decrease the amount of heat flow in case of special requirements. A hand switch is also provided for manual On-Off operation without disturbing the dial program. The regulator operates with all types of fuel in all classes of building—apartments, residential, commercial or industrial.

Automatic Devices Co., Inc., Western Springs, Ill.

Air Conditioner (21)

The new Summer Weathermaker is an air conditioning "package" located inside the house which is a little larger than the standard room air conditioner. Unit takes care of the job of cooling, dehumidifying, and circulating filter-cleaned air for the entire home. Refrigeration is supplied through two small copper tubes running from an air-cooled refrigerating unit located outside the dwelling. It is designed for installation completely independent of the heating system in homes equipped with warm water or steam heat or to provide air conditioning for those without any central heat at all. Unit can be suspended from the ceiling of a closet or utility room, placed in a crawl-space or attic, or hung from overhead floor joists in a basement. The air-cooled refrigerating unit in its weatherproof, tamperproof cabinet can be installed outside in the yard, in a garage, or in the basement with the addition of ducts for outside air. It will be available in 2- and 3-ton capacities for low and medium priced homes, and in a nominal 5-ton size for larger residences.

Carrier Corporation, Syracuse, N. Y.

Fluorescent Fixture (22)

A new fluorescent fixture for street-lighting applications. Upper hood is of laminated polyester fiber glass. With internal pigmentation, its color is permanent, requires no painting, and is inherently corrosion resistant. The clear, weather-protecting lower cover is also of plastic, with the main extrusion of methyl methacrylate chemically welded to colored ends of the same material. The internal, structural chassis is of steel and aluminum. Unit can be mounted horizontally or tilted at an angle.

Westinghouse Electric Corp., Pittsburgh 30, Pa.

Generator (23)

A new lightweight portable generator for temporary or emergency sources of electric power in factories and homes. It can be carried by one man, yet puts out 1500 watts of electricity, enough to operate small tools, floodlights, deep freeze units, electric pumps, or any other similar electrical equipment. A 4-cycle, direct-drive, 3-hp gasoline engine runs the generator. Because of its automatic rewind starter and two built-in sockets, it can be plugged in. Available for dc or ac.

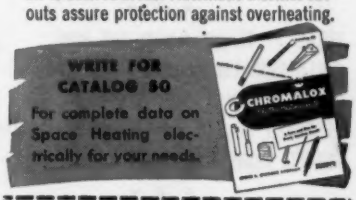
Master Vibrator Co., 262 Stanley Ave., Dayton, Ohio

THE HEAVY DUTY BLOWER TYPE

SPACE HEATERS FOR

PORTABLE or PERMANENT COMFORT HEATING

Now it's easy to heat the smallest office or largest shop to a comfortable level in coldest weather with Chromalox Electric Unit Heaters. Units are available for portable use or permanent mounting to walls and ceiling, and only Chromalox gives you famous Chromalox Heating Elements. Motor driven fans assure positive air circulation which eliminates cold spots. On larger models, ducts can be used to convey heated air to desired areas. Automatic thermal cut-outs assure protection against overheating.



Industrial Div., EDWIN L. WIEGAND CO., A-4432
7637 THOMAS BLVD., PITTSBURGH 8, PA.

Please send me free copy of CATALOG 50

Name_____

Company_____

Street_____

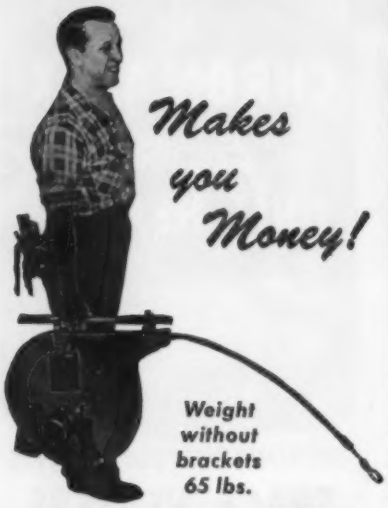
City_____ Zone_____

State_____

CHROMALOX

ELECTRIC HEATING AT ITS BEST!

THE ONLY COMPLETE
WIRE-PULLING POWER TOOL



Makes you Money!

Weight without brackets 65 lbs.

ONLY ONE SETUP IS NEEDED!

PUSHES 45 Ft. of fish tape per min.
PUSHES around five 90° bends.
STOPS automatically if obstructed.
PUSHES 175 Ft. of .060″ x ¼″ usable highest quality tape.
MAY BE USED in any position.
INDICATOR shows how many feet of tape is pushed into conduit.

★ ★ ★

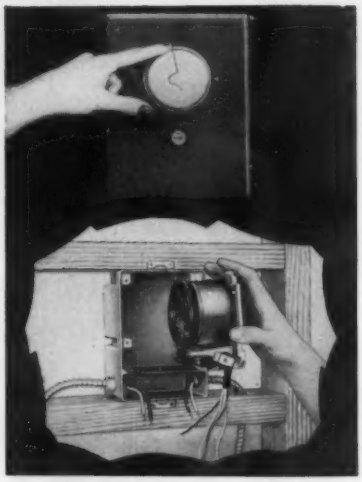
PULLS 17 Ft. per minute, full load.
PULLS 1200 Lbs. (equals pull of 8 men).
PULLS wire in ¾″ to 2″ conduit.
OPERATES on 115 Volt AC or DC Current.
RUGGED, Heavy Duty Construction.

★ ★ ★

SAFE! The fish tape is always in the conduit or in the tool . . never free to come in contact with moving machinery, bus bars, live wires, etc.

AVAILABLE THRU YOUR NEAREST { General Electric Supply Co. / Graybar Electric Co. / Westinghouse Electric Supply Co.

The **BARTH** CORPORATION
12652 BROOKPARK RD., CLEVELAND 29, O.



Light Control (24)

A new low-cost method of controlling the light intensity of rapid start fluorescent lamps. The system consists of a Luxtrol light control used in conjunction with ballasts designed specifically for the application. Wide applications should be found in homes, stores, offices, schools and any other installations where fluorescent lighting is employed. Luxtrol type WBD360, which controls a maximum of eight 40-watt rapid start fluorescent lamps, meets most requirements. For circuits involving more than eight lamps, larger capacity Luxtrol light controls should be considered. Wiring of the Luxtrol and ballast combination into the fluorescent lamp circuit is different from the wiring used when a Luxtrol is employed to control incandescent lamp. However, ballasts designed for the application must be used. No other ballasts will operate.

Superior Electric Company, Bristol, Conn.

Controller (25)

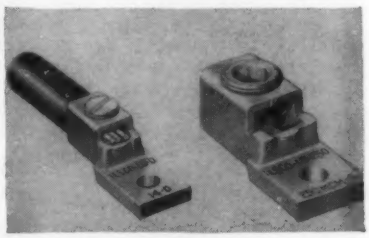
A new die cast safety handle is now optional equipment on R44 drum controller. Cast to conform to the top of the case, the handle has no protruding edges for accidental operation. Designed to fit the palm of the operator's hand, only slight finger tip pressure is necessary to change the contacts from off to forward or reverse. Reversing controllers are for use on lathes, milling machines, woodworking machines, conveyors, dairy and many other types of equipment. Controllers have heavy-gauge steel frame and large, hard-rolled, copper contacts. Front removable wrap-around cover completely exposes all contacts and provides accessibility to all terminals. Booklet No. 5411 is available.

Furnas Electric Co., 1067 McKee St., Batavia, Ill.

Range Receptacle (26)

Redesigned surface range receptacles, Cat. No. 112, feature easy-to-wire "Quik-Lok" terminals. Top lug opens in a jiffy to allow free access of the cable. It then locks into position by a few turns of the single screw. Made especially for electric range connections, this new type receptacle also uses a new bakelite terminal block. Available in black or ivory housing, the receptacle is rated at 50 amps, 250 volts. It is listed by Underwriters' Laboratories. Literature is available.

Eagle Electric Mfg. Co., Inc., 23-10 Bridge Plaza South, Long Island City 1, N. Y.



Solderless Lugs (27)

This line of LO solderless lugs is now being produced with open barrel. They are offered in 125, 225, 300 and 400-amp sizes. Advantages offered are greater wire holding space and visual insertion of cable. New design is produced from hard tempered copper tubing which assures unusual strength. Because of the 100% pure electrolytic copper used, heat tests show an average of about one-half the permitted temperature rise.

Ilsco Corporation, Mariemont, Cincinnati 27, Ohio

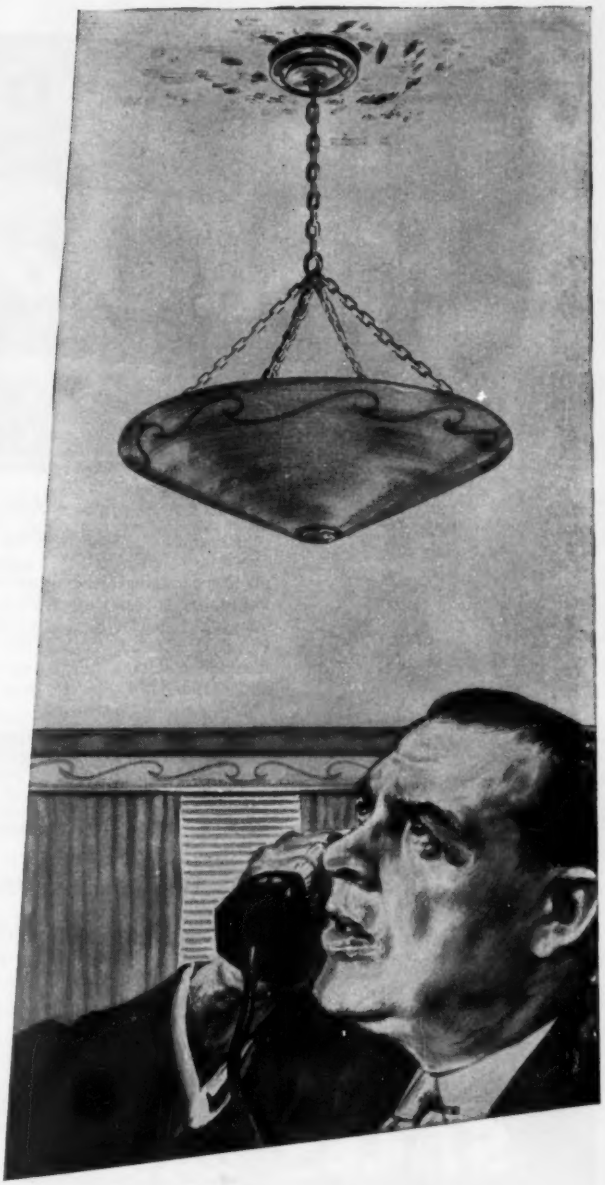
Window Ventilator (28)

An all purpose fan called the G-E year-round window ventilator has been introduced. By snapping in and out of unbreakable, weather-resistant clear plastic panels, which allow sunlight to pass through, it can be used as either an intake or exhaust fan. Grid guard makes it possible to use the new model independently of the panels as a table, floor or wall fan. It is designed for use in any room in the house and even in casement windows by means of a mounting hanger. It features an in-line switch on the cord. It will change the air in most kitchens once every minute, and will also remove odors and grease in the exhaust position.

General Electric Co., 1285 Boston Ave., Bridgeport, Conn.

10 SECONDS

COULD HAVE SAVED A $50,000 CUSTOMER



The job was perfect, but when freshly painted ceilings were smudged and smeared, the contractor lost the customer. Sticky, messy tape was the cause . . . it stuck to fingers and fingers touched the ceiling.

Ten seconds of time could have saved this customer, because in just *10 seconds* you can learn about a tape that sticks where it is supposed to and will not smudge off on hands.

Send today for your ACCURATE 10 SECOND TEST KIT . . . no claims, no hearsay . . . the proof is in the product for you to see.

ACCURATE TAPE

ONE PLANT . . . ONE PRODUCT — a mc — ELECTRICAL TAPE

FRICTION TAPE
RUBBER TAPE
PLASTIC TAPE

ACCURATE MFG. CO.
47 Hepworth Place, Garfield, New Jersey

Please send me, without obligation, an ACCURATE 10 SECOND TEST KIT.

NAME_____
FIRM_____
ADDRESS_____
CITY_____ ZONE____ STATE_____

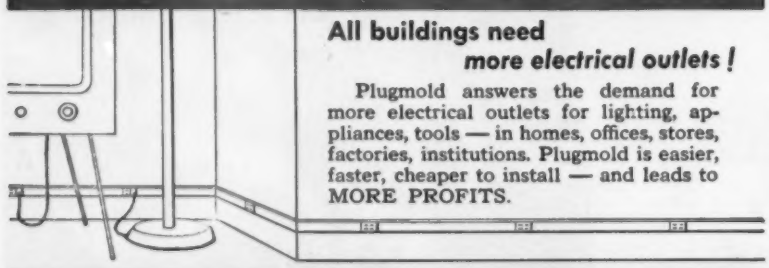
You get More Business with PLUGMOLD

PROFIT 3-ways

Prizes for everyone!

Plugmold opens the door to *extra profits* . . . profits on Plugmold sales — profits on extra rewiring business — and valuable prizes, too! EVERY SALE of Plugmold EARNS VALUABLE PRIZE POINTS FOR YOU. Special New Kitchen Package helps you merchandise and sell Plugmold. Ask your jobber.

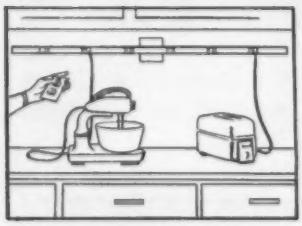
OUTLETS unlimited



All buildings need *more electrical outlets!*

Plugmold answers the demand for more electrical outlets for lighting, appliances, tools — in homes, offices, stores, factories, institutions. Plugmold is easier, faster, cheaper to install — and leads to MORE PROFITS.

SALES unlimited



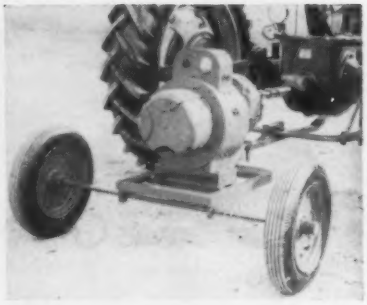
Plugmold Kitchen Package leads to *bigger jobs!*

For NEW WIRING or REWIRING, Plugmold is the most economical, modern way to provide plenty of outlets. Once your customers try Plugmold in the kitchen, they'll want it *in every room.* Install the Kitchen Package in your own home and see for yourself.

WIREMOLD'S Full Profit Line *Builds Better Business* for YOU

WIREMOLD Surface Raceways	PANCAKE Overfloor Raceways	WIREMOLD Fluorescent Units

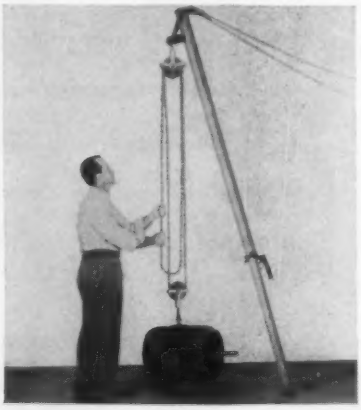
The WIREMOLD Company
Hartford 10, Connecticut



Portable Generator (29)

A new type of portable electric generator has been developed to meet the need for emergency electric power on farms and other outlying areas which might suffer failure of power lines in cases of storms, tornadoes and similar occurrences. This type of generator is mounted on wheels, made in sizes of 5-7½-10 and 15 kw, and designed to be operated from the power shaft of a common tractor. Called "Electrotrac", this new generator can be connected directly to the power take-off shaft of a tractor within five minutes. Widespread availability of tractors in outlying areas makes this type of generator useful not only for emergency use but also for use in powering electric equipment in places where regular electric lines are unavailable.

Electric Power Plants Corp., Cadiz, Ohio.



Portable Skyhook (30)

The Magic-Pole Unipod is a portable skyhook that will provide a sturdy support for hoists while lifting, shifting, or lowering equipment, at almost any location, either indoors or out. The Standard model supports 2000 lbs., weighs 22 pounds. It can be closed to 6-ft. 4½-in. for storage or convenient size to carry onto job. On location, it can be extended by 6-in. steps to 10-ft. 2-in. Any position is held by locking handle, which is secured by a chain to prevent loss. Hoist is kept clear of Magic-Pole by a built-in outrigger. Two high strength 20-ft. guy lines are included as standard equipment. Though each line will support over one

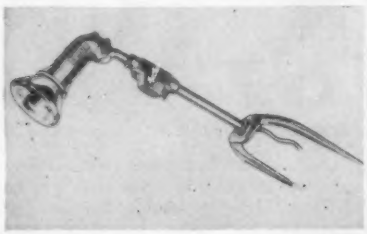
ton, actual requirements do not normally exceed 250 lbs. per line. Therefore, indoors the lines can be secured to posts or nearby machinery. Stakes are used outdoors.

B. E. Wallace Products Co., Exton 10. Pa.

Switch **(31)**

Bulletin 920 remote control switch is now available with a control line fuse and adapter. The adapter may be purchased as a separate item and added to an existing remote control switch. The adapter may also be obtained as an integral part of a new switch. Bulletin 920 switches are Underwriters' Laboratories approved to 600 volts ac, 250 volts dc. Switches provide accessible and convenient control of light and power circuits. They may be actuated by pushbuttons, timers, toggle switches, or similar devices. They are designed for installation on panelboards and switchboard and for separate installation on sub-panels. Publication 559 is available.

Automatic Switch Co., 391 Lakeside Ave., Orange, N. J.



Fork Light **(32)**

A newly designed fork light for use at home or at work—for either outdoor living in the summertime or Christmas lighting. Unit consists of adjustable, non-rusting aluminum fittings that are weatherproof. The assembly consists of an aluminum two-tine fork, ½-in. extension, conduit nipple, plug and sealed-beam flood lamp. All units are supplied with rubber covered wire and plugs. Can be furnished with or without weatherproof switch.

Killark Electric Mfg. Co., Vandeventer and Eastern Ave., St. Louis 13, Mo.

MOST TROUBLE-FREE PROTECTION YOU COULD INSTALL!

Pierce Fuses Operate 10 to 40% Cooler!

Unique screened venting permits air to circulate freely through Pierce Fuses. This allows free escape of excess heat — prevents rapid charring and deterioration of the fuse case, as in ordinary fuse construction.

Pierce Fuse Cases Last 6 to 8 Times Longer!

Yes, this venting actually makes Pierce Fuse cases last 6 to 8 times longer! No wonder these time-proved, renewable fuses are so popular!

No Unnecessary Blows!

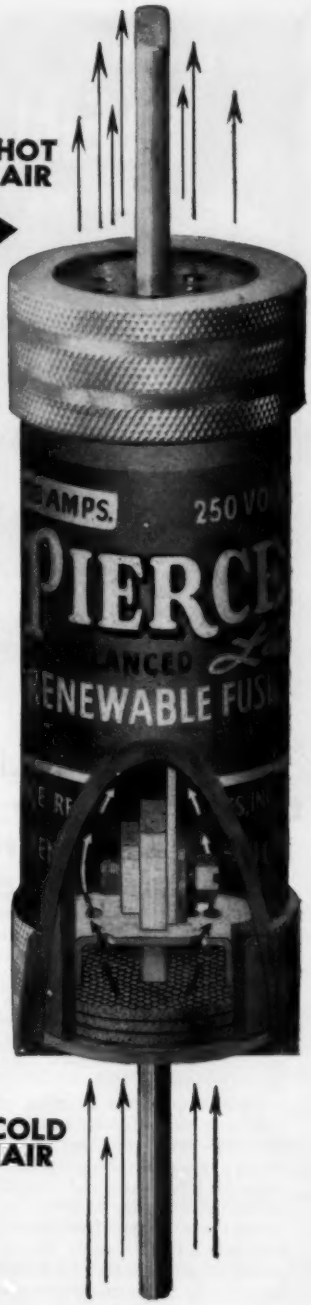
Pierce Screened venting and balanced lag links prevent wasted links during safe overloads.

No More Danger of Afterblows

Since dangerous gases and heat have free escape, Pierce Fuses are your insurance against afterblows.

HOT AIR

COLD AIR



(Also a complete line of quality non-renewable fuses.)

WRITE TODAY for this factual bulletin. Start now to enjoy Pierce benefits.

PIERCE RENEWABLE FUSES, INC.
LEICESTER NEW YORK

Pat. Pend.

*KLEIN KUT PLIERS

for both regular and heavy-duty cutting

It was Klein that produced the first and still the finest regular side-cutting plier. Klein also gave the industry the modern, streamlined version so much in demand.

And it's Klein again with a new, high leverage cutting plier for light- or heavy-gauge wire, including No. 2 weatherproof hard drawn solid copper wire, and A.C.S.R.

There's no extra hinging of any kind—no uncomfortable wide-spread handles—with this new Klein-Kut Plier. The offset hinge permits the extra-high leverage and operation is as smooth and easy as with any other Klein Plier. Forged from high-grade tool steel, individually fitted, tempered, adjusted and tested. Ask for No. 213-9 N.E. for streamlined pattern.

Regular pattern available

Same high-leverage design, but in the original Klein side-cutting pattern. Ask for No. 213-9.

Write for free Copy of Bulletin 1054

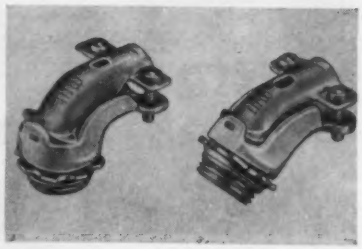
*Trade Mark

ASK YOUR SUPPLIER

Foreign Distributor: International Standard Electric Corp., New York.

"Since 1857"

Mathias KLEIN & Sons



Connectors (33)

Two-screw, 45- and 90-degree, hinged cap, angle connectors, for non-metallic cable, armored cable, flexible steel conduit. Fittings are designed with a screw on each side of opening to provide a secure grip on cable; and are of sufficient length to permit cable to be installed without removing cap. Connectors are made with a malleable iron body and formed steel cap and locknuts; are cadmium plated for protection against corrosion. Available in standard trade size ⅜-in.; fit ½-in. threaded hub or knockout. Minimum and maximum openings for cable are ⅜-in. and ⅞-in.

Midwest Electric Manufacturing Co., 1639 W. Walnut St., Chicago 12, Ill.

Service Drop Cable (34)

A new type of service drop cable designed especially to withstand the abrasive wear and cutting action of tree limbs, known as TreePlex. To the already tough polyethylene insulation covering each power conductor, a tight, thin (.005-in.) sheath of Nylon has been added. Compound has been heat- and light-stabilized, for weather resistance. Increased capacity to withstand abrasion and impact makes it possible to install TreePlex directly through heavy trees, without any necessity for tree-trimming or tree guard. Neutral-supported TreePlex service drop cable is available in duplex, triplex and quadrex types. It can be obtained with copper or aluminum power conductors spiralled around neutral messengers of copper, Copperweld, ACSR or aluminum.

Rome Cable Corporation, Rome, N. Y.

Voltage Regulator (35)

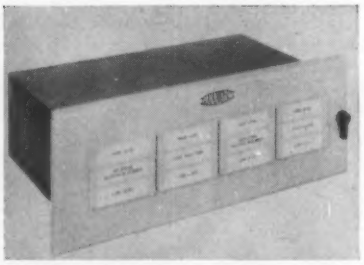
A new type all static voltage regulator for 60 cycle ac alternators, designated the Inet RX60. Constructed of all static components, the regulator has no tubes or moving parts. Designed for use with any type 60 cycle alternator in ratings from 1 kva to upwards of 5000 kva, the unit offers regulation of plus or minus ½%. It may be used for machines with or without an exciter. Unit consists of two separate elements, the regulator and the exciter. The regulator portion is a panel mounted assembly with a voltage adjusting control for setting the voltage at the desired value. The regulator has a voltage reference which is compared to the voltage that is to be maintained. The difference between the reference and the value to be held is amplified by magnetic amplifiers. The power or exciter section contains the power stage which excites the field of the exciter and controls the voltage of the alternator.

Inet Division of Leach Corporation 4441 Santa Fe Ave., Los Angeles 58 Calif.

Flood Lamp (36)

A new 200-watt PAR-46 flood lamp of the all-glass sealed-beam type for indoor and outdoor lighting use. It is designed to produce a controlled beam of light substantially rectangular in pattern. Its glass is thermal shock-proof. Lamp produces a "narrow to medium" distribution of light from a compact source. Included among the various applications are: down-lighting of tables and counters in stores; flooding of merchandise on display in show windows; lighting of stage aprons from auditorium ceilings as well as special lighting effects on stage; floodlighting of buildings; service station lighting; supplementary and inspection lighting in industry; and outdoor protective floodlighting.

General Electric Co., Nela Park, Cleveland 12, Ohio



Annunciator (37)

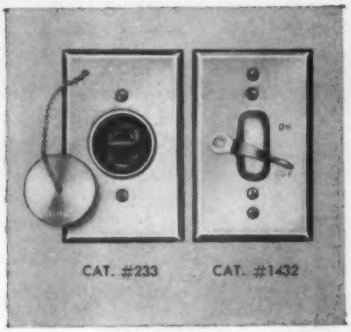
An audio-visual annunciator which utilizes one plug-in relay unit for each 3-light, high-low station has been announced. Each alarm station consists of a tier of three back-lighted windows. The top window designates "high" off-normal, the middle window designates "normal" and the lower window "low" off-normal operations. All alarms operate with a common audible signal, common flasher and utilize a common acknowledgment button. The annunciator utilizes hermetically sealed Panalarm plug-in relay units wherein relays and contacts are permanently protected against dust and moisture. The entire system is suitable for Class 1, Division 2 locations. Bulletin HL-30 is available.

Panalarm Division of Panellit, Inc., 7449 Hamlin Ave., Skokie, Ill.

ADV.

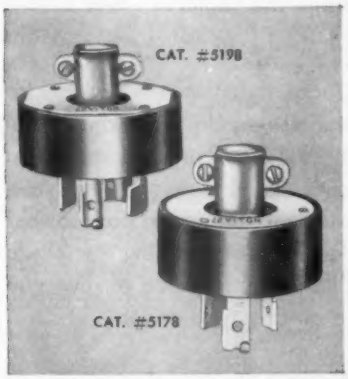
NEW PRODUCTS

Leviton Outdoor Devices Unaffected by Weather



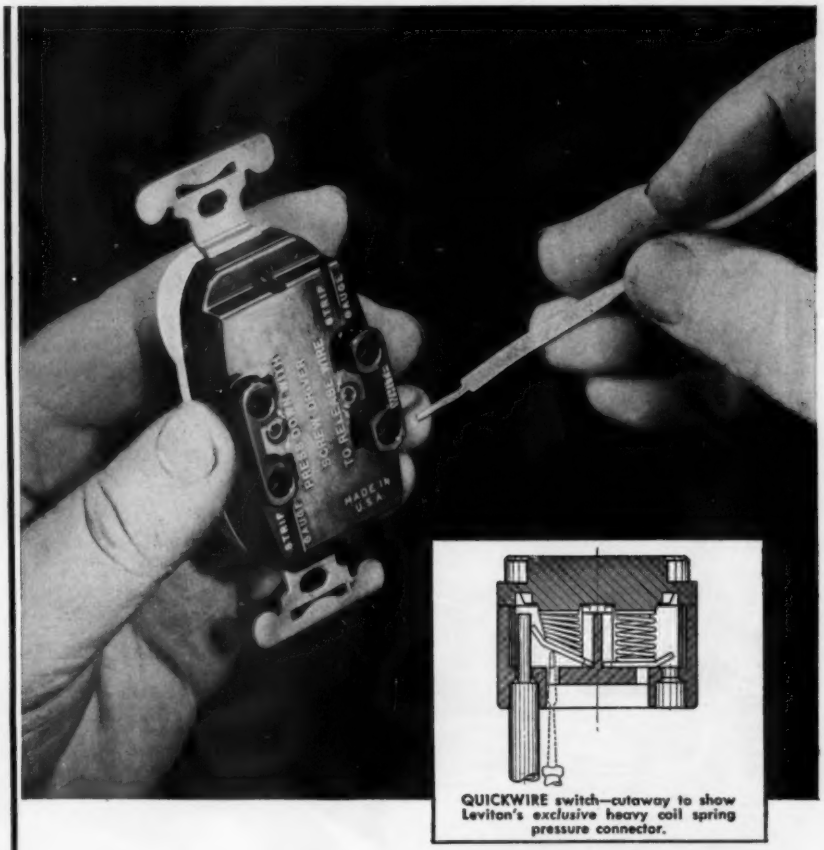
Ideal for outdoor installations — on patios, porches, garages, industrial structures — Leviton Weatherproof Switches and Receptacles offer *complete* protection against the elements. Leviton single-pole and three-way switches, for example, are fully enclosed. Each has a rubber mat behind the cover plate and is lever operated, so that operation is not affected by moisture. Receptacles have cover, on a chain, which screws into outlet when not in use. Each device individually boxed, with corrosion-resistant plate and screws included for easy installation.

LEV-O-LOCK Rubber Caps Minimize Shock and Breakage



LEV-O-LOCK Rubber Caps afford *extra* protection against shock and breakage often encountered in industrial installations. Order type 5178 caps for 20 Amp., 3 wire, or type 5198 for 20 Amp., 4 wire. Sturdy construction features assure long life; latest design makes installations fast and easy. Other famous LEV-O-LOCK devices, in bakelite, listed by the Underwriters' Laboratories, are available in 2, 3 and 4 wire, 10 and 20 amp. caps, connectors and receptacles.

For complete information write Leviton Manufacturing Company, Brooklyn 22, N. Y.



EASILY THE BEST!

— Quick and easy installations are done best with

NEW LEVITON Quickwire

spring type, screwless terminal switches and receptacles.

QUICK — because there are no wire loops to make, no screws to loosen and tighten. EASY — because you simply strip the wire and push it into hole. BEST — because Leviton's **exclusive** heavy coil spring connector holds the wire in place firmly, making permanent contact. To release, simply insert a screwdriver into the release hole.

You save time, money, labor costs when you use QUICKWIRE spring lock switches and receptacles. Simple, easy-to-read instructions are molded into the Bakelite on each device. Deeply recessed wire wells prevent exposure of bare wire. Fully enclosed housing, plaster ears, and handy strip gauge marking on each device.

QUICKWIRE receptacles are available in brown or ivory phenolic. Switches have either brown or ivory toggles and the same famous Leviton switch mechanism — known for service and dependability the world over. And both devices meet UL, CSA and Federal Specifications, of course.

Your best jobs are done with... **LEVITON**

For full information write:

LEVITON MANUFACTURING COMPANY • BROOKLYN 22, N. Y.

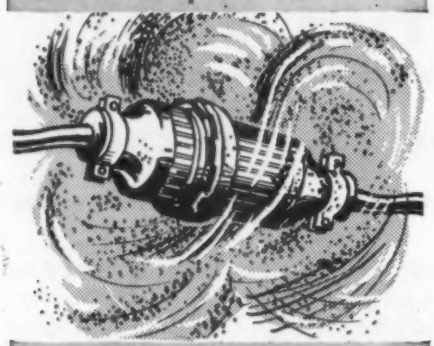
Chicago • Los Angeles • Leviton (Canada) Limited, Montreal

For Best Results Use Wire By AMERICAN INSULATED WIRE CORPORATION

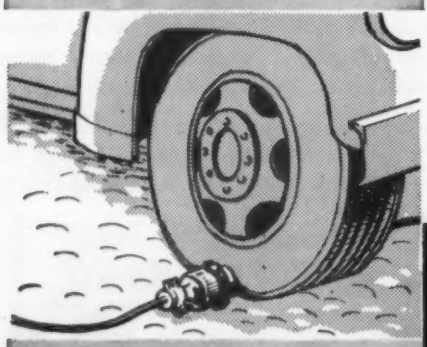
This trade-mark identifies

...the most remarkable *New* connector

it seals out moisture!



it seals out dirt!



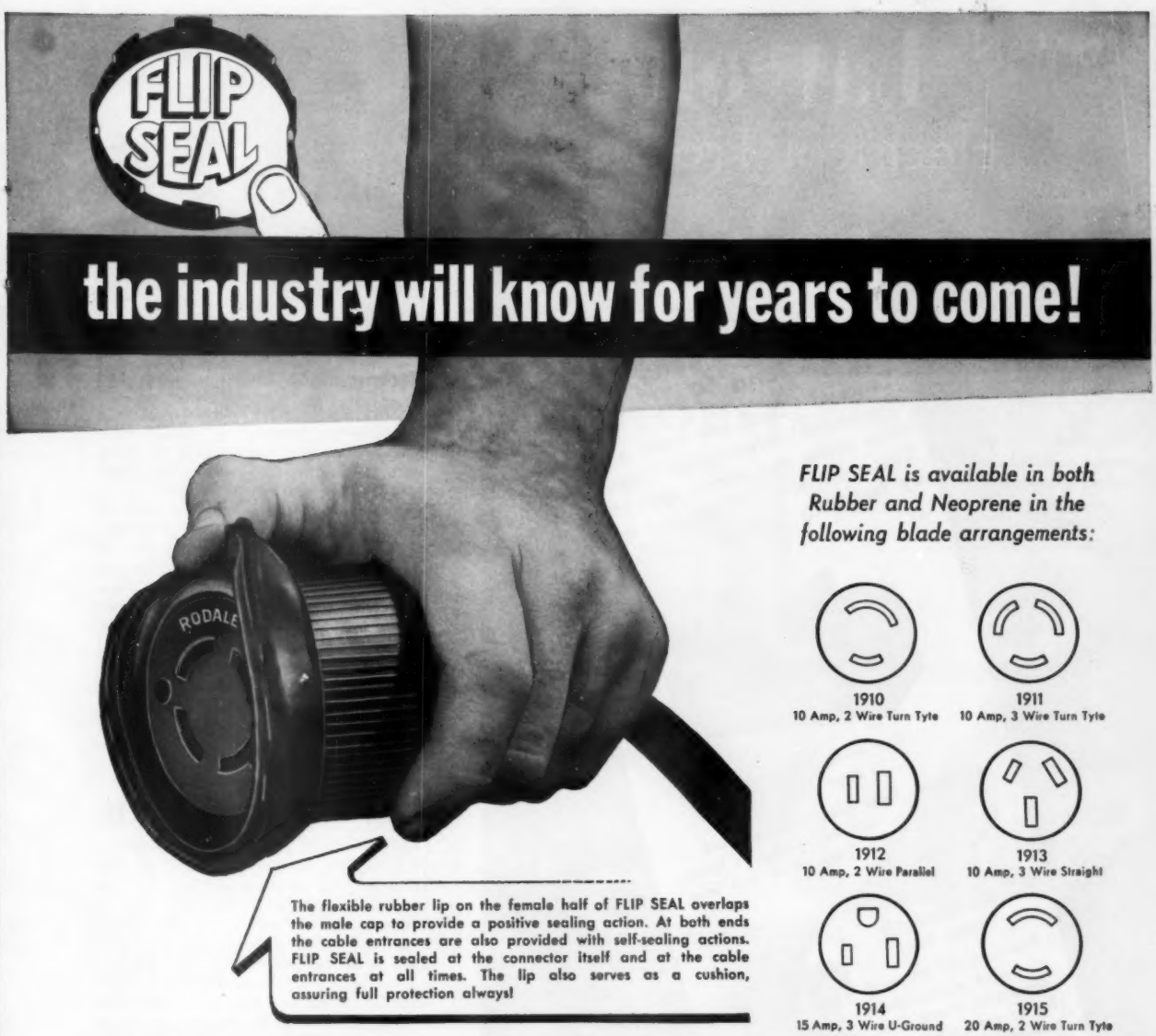
it offers you protection never before possible!

FLIP SEAL, Rodale's brand-new concept in the field of electrical wiring devices brings you features never before possible in any connector!

FLIP SEAL is a heavy-duty, ruggedly-constructed connector which instantly seals out all moisture, dust, dirt and metal particles — and brings you *cushioned protection* against all forms of shock and accidents! It is a complete unit, ready for quick and easy wiring, available in both rubber and neoprene in the widest possible variety of blade arrangements for *any* installation! It is tested to give you guaranteed superior service on any type of job.

FLIP SEAL is priced for the mass market. It is priced so that every portable connector can now be replaced with a FLIP SEAL connector and offer greater protection and greater savings in time and money. FLIP SEAL eliminates

FLIP SEAL is an entirely new principle in wiring device and part of the line of more than 600 wiring devices for home, industry and community manufactured by...



the industry will know for years to come!

The flexible rubber lip on the female half of FLIP SEAL overlaps the male cap to provide a positive sealing action. At both ends the cable entrances are also provided with self-sealing actions. FLIP SEAL is sealed at the connector itself and at the cable entrances at all times. The lip also serves as a cushion, assuring full protection always!

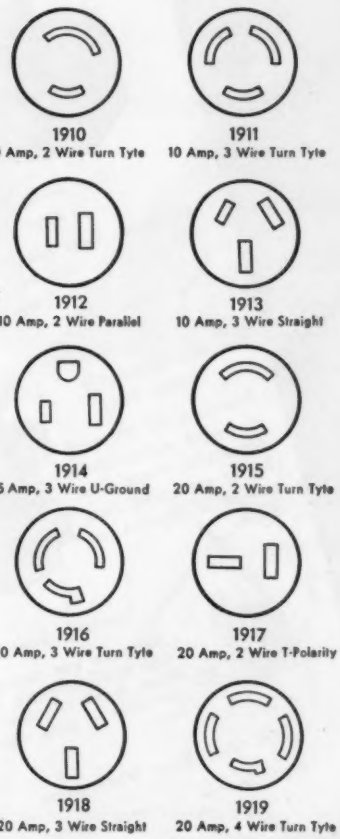
the cost and loss of time that occurs when a faulty, broken connector must be replaced.

Test FLIP SEAL yourself. Subject this amazing connector to the most extreme tests of abuse — it can be run over with a truck, dropped from a great height, stepped on, submerged in water — and it will continue to do its job!

Investigate the innumerable possibilities of this new, low-priced weatherproof connector and you'll start to specify Rodale's FLIP-SEAL

Pat. App. For

FLIP SEAL is available in both Rubber and Neoprene in the following blade arrangements:



1910
10 Amp, 2 Wire Turn Tyte

1911
10 Amp, 3 Wire Turn Tyte

1912
10 Amp, 2 Wire Parallel

1913
10 Amp, 3 Wire Straight

1914
15 Amp, 3 Wire U-Ground

1915
20 Amp, 2 Wire Turn Tyte

1916
20 Amp, 3 Wire Turn Tyte

1917
20 Amp, 2 Wire T-Polarity

1918
20 Amp, 3 Wire Straight

1919
20 Amp, 4 Wire Turn Tyte

Rodale MANUFACTURING CO., Inc. • EMMAUS, PA.

Warehouses in Chicago & Los Angeles
Representatives in all Principal Cities
Selling Exclusively Through the Electrical Jobber

FULLMAN **Latrobe**
Electrical Products

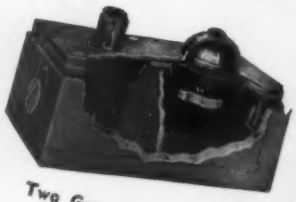
Floor Boxes and Wiring Specialties

ADJUSTABLE WATERTIGHT FLOOR BOXES
•
NON-ADJUSTABLE WATERTIGHT FLOOR BOXES
•
ADJUSTABLE GANG FLOOR BOXES 1-2-3 AND 4
•
FLOOR JUNCTION BOXES

FULLMAN MANUFACTURING CO. QUALITY LATROBE SUPREMACY LATROBE, PA.

Serve Long and Well

Years of actual use have earned impressive leadership for "Latrobe" floor boxes and wiring specialties. You same time, money and worry by installing "Latrobe" products.



Two Gang Adjustable Floor Box

Adjustable Boxes come in single-round or square bodies. Also in square type Single Gang, Two Gang, Three Gang and Four Gang Boxes.

Non-Adjustable Floor Box

Represents the last word in unique design, neat appearance, fewest number of parts, and least amount of labor to install.

Insulator Supports

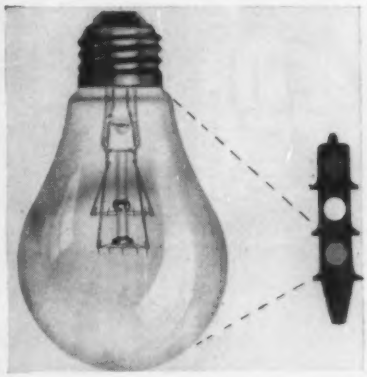
Malleable iron clamps of high tensile strength. Four sizes to fit all standard porcelain or glass insulators.

Sold Only Thru Wholesalers

Write for new illustrated Catalog

UTILITY OUTLETS
•
NOZZLES AND FLOOR BOX ACCESSORIES
•
INSULATOR SUPPORTS
•
PIPE AND CONDUIT HANGERS
•
ARMORED CABLE SUPPORTS
•
CABLE CLIPS
•
STAPLES
•
FISH WIRE

Fullman Manufacturing Co.
1209-1215 JEFFERSON STREET
LATROBE, PA.



Electric Light Bulb (38)

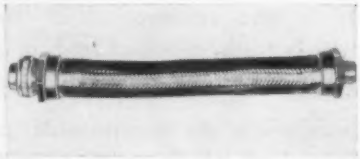
A new electric light bulb with a built-in safety device designed to prevent accidents at road intersections, railroad crossings, bridges, airports, etc. The lamp (dual traffic signal) contains two filaments. A 50-watt filament designed for 5000 hours life and 25-watt filament designed for 8000 hours. When the 50-watt filament burns out the 25-watt filament continues to burn with a lower light. This light is sufficient to give a warning to the public, but dim enough to warn that the lamp needs replacing. The 75-watt dual traffic signal lamp has a medium base, is enclosed in an A-21 bulb and may be used in any position.

Solar Electric Corporation, Warren, Pa.

Plastic Tape (39)

A new plastic electrical tape is .007-in. thick, with a dielectric strength of 1000 volts per mil of thickness average. Its tensile strength is 20 lbs. per inch in width, minimum; stretch is 150% minimum, and adhesion to high polished surfaces is 30 oz. per inch width. Tape is packed in 10-roll dispenser cartons, ¾-in. wide by 20 feet per roll; or in individual tins, ¾-in. wide by 60 feet per roll. It is approved by Underwriters' Laboratories, Inc.

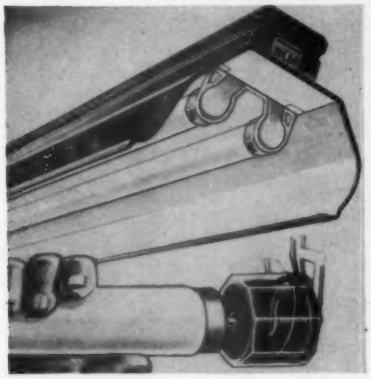
Chase & Sons, Inc., Randolph, Mass.



Coupling (40)

An explosion-proof flexible coupling designed for safer wiring of installations in vibration areas. For use with the hanging of explosion-proof fixtures, or for installation of motors. They cannot shake loose and are U.L. approved. Base and fittings are made of solid brass. Available in all combinations of hubs. Conduit diameters from ½-in. to 2-in.

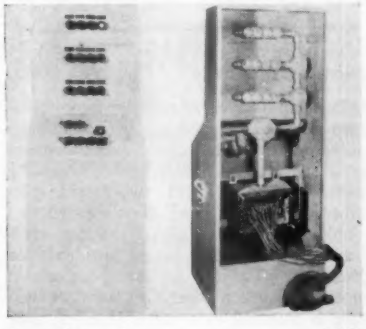
Killark Electric Mfg. Co., Vandeventer and Easton Aves., St. Louis 13, Mo.



Fluorescent Lighting Units (41)

"Magna-Flo" fluorescent lighting units with "Springlox" lampholders, especially designed for the T-12 slimline lamps. "Magna-Flo" systems for 96-in. and 48-in. lamps with twin or triple-lamp lampholders. They may be mounted individually or in continuous lines. "Springlox" lampholders are all metal, one-piece constructed; positioned in channels by a slotted arrangement that permits precise, rigid mounting so that lamp alignment and spacing are always correct. A cut-out type terminal switch automatically disconnects primary current when lamp is removed. Other "Magna-Flo" features include four porcelain-enameled reflector styles; open and closed end with solid or apertured tops. All reflectors bear RLM label. All porcelain-enameled channels are available for locations with excessive moisture. Longitudinal shields are available for all 2-lamp units to increase shielding angle to 27°. The 96-in. systems are designed with two-piece reflectors, which are kept in alignment by means of a positive alignment clip and rigid overlapping construction. Bulletin is available.

Benjamin Electric Mfg. Co., Des Plaines, Ill.



Panelboard (42)

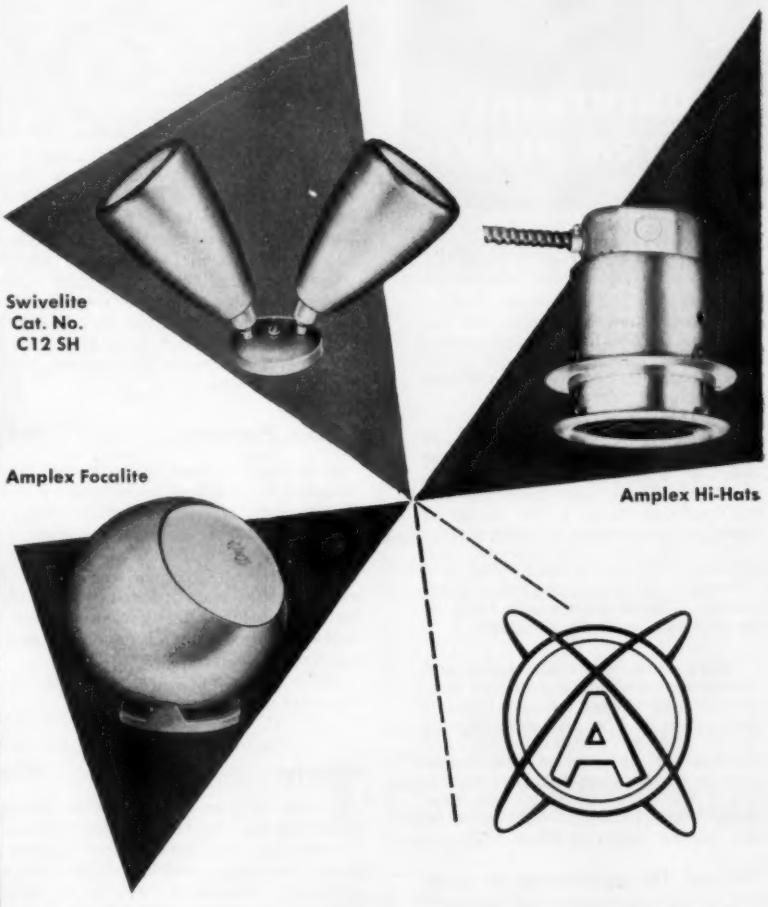
Explosion-proof panelboard allows remote control of fuse cavity drilling machine. The panelboard enables an operator—from a remote location—to monitor the tool positions of the drilling machine's feed and indexing cycles. The panel's upper section contains pilot lamps, which indicate to the operator the relative positions of various machine parts. Mounted on the panel's lower section are pushbut-

NEW LIGHT ON SELLING!

amplex

Accent Lighting Fixtures

ARE PROVED PROFIT-MAKERS!

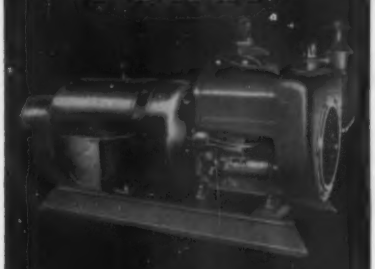


SMART, MODERN accent lighting fixtures can enhance the beauty and selling-power of your displays. Small wonder that the new AMPLEX models are the choice of display men—they lead the field because they do a real *selling* job!

For still greater effectiveness, use the lamps especially designed for these fixtures—AMPLEX Spots, Floods and Colorbeam Reflector Lamps. Write today for catalog describing the AMPLEX Swivelite "big four" exclusive features.

amplex Corporation, Dept. ECM-2, 111 Water St., Brooklyn 1, N. Y.

"Packaged Electric Power"



UNIVERSAL ELECTRIC PLANTS

Simplified, Sized Right

Size and weight are down—output is up with new Universal Electric Plants. For example, this compact 4-cylinder, air-cooled model delivers 10,000 watts—all voltages available.

For permanent installation or portable service, Universal gives you a wider choice of modern models. Here are favorites for all purposes with a full range of emergency-standby electric plants. You name the controls—we can deliver. From manual starting through all types to fully automatic. These plants are built to *your* needs, controls included.

More sizes—both air-cooled and water-cooled—insure you the correct money-saving model. Capacities up to 25 k.w., AC and DC—1, 2, 4, and 6 cylinders. All are backed up by one of the oldest names in the electric plant industry. We have produced continuously since 1914 . . . have been in the engine business since 1898.

We ask the opportunity to show how we can serve you better

Helpful guide of all Universal air-cooled models plus facts on water-cooled series mailed on request. Write today for this and list showing low Universal prices.

UNIVERSAL MOTOR COMPANY

438 UNIVERSAL DRIVE
OSHKOSH, WISCONSIN

ONE OF AMERICA'S LARGEST, OLDEST BUILDERS OF ELECTRIC PLANTS

tons and selector switches to control the machine's operation. Located within a concrete barricade and unobserved by its operator, the drilling machine automatically drills 1.870-in. cavities in the detonator ends of ammunition shells. The board is equipped with C-H explosion-proof and dust-tight conduits to protect its electrical circuits and apparatus from the presence in the air of ether fumes and explosive dust particles. Controls are EGP pilot lights, push buttons and selector switches. A type EJB junction box and several GUA conduits protect terminal connections and wiring.

Crouse-Hinds Co., Wolf and 7th North Sts., Syracuse, N. Y.

Boxesand Covers (43)

A complete new line of Raco Handy-Boxes and Raco Handy-Box covers has been announced. Boxes are deep drawn, one-piece, solid steel boxes. Corners are full metal thickness, strong, smooth and rounded so they will not crack. The box bottoms are stronger and flatter for easier mounting on flat surfaces. Boxes are standard in 1½-in., 1⅞-in. and 2⅛-in. depths. Handy-Box covers have rounded corners and curved edges forming a neat appearing flange. Special feature—the pre-assembly of coverbox and cover box screws without special washers or other retaining devices. Covers are available plain, with single knockout, single device, duplex device, switch and Despard knockout openings.

All-Steel Equipment Inc., Aurora, Ill.

Mobile Platform (44)

A new mobile work platform especially designed for overhead maintenance where the platform must be rolled over rough terrain. Platform comes in one piece. It may be used at any desired height. All welded steel construction. Entire unit is mounted on a trailer; leveling jacks are included. Ideal for all overhead maintenance such as painting, lighting, cleaning, reaching pipes, etc.

Atlas Industrial Corp., 849-39th St., Brooklyn 32, N. Y.

Adaptor (45)

A new adaptor for use with 3-wire grounding caps has been designed to comply with a new Underwriters' Laboratories, Inc. ruling which specifies 3-wire grounding attachment caps on portable electrical equipment intended for industrial use. Designed to adapt standard 2-wire outlets for immediate use with 3-wire grounding caps, the adaptor is made of bakelite. Other features include: polarized parallel blades, parallel polarized slots and U-shaped grounding hole. It comes with 3-in. green grounding lead with hook-type terminal lug for connecting to ground. The lead is anchored to the adaptor with a green hexagon head screw. Rated 15-amp, 125-volt.

Leviton Manufacturing Co., 236 Greenpoint Ave., Brooklyn 22, N. Y.

Electric Saw (46)

A new portable electric saw, Model 52B, having a maximum cutting capacity of 3¼-in. with a 10-in. diameter blade, has been added to this line. It has a flat belt drive. The 1½-hp motor drives the 10-in. blade at 4000 rpm under load—cross cutting or ripping in hard or soft wood. Saw can be adjusted for depth of cut from 1½-in. to 3¼-in. and to make angle cuts from 90° to 45°. When fitted with proper abrasive disc, it will cut stone, concrete tile, brick and other composition materials. Complete outfit includes saw, combination blade, blade wrench, and 15 feet of 3-conductor cable. Literature is available.

Syntron Company, 690 Lexington Ave., Homer City, Pa.

Commercial Units (47)

A new series of commercial luminaires specially designed for low fixture-ceiling contrast and featuring low surface brightness, streamlined contour and an ultra-shallow appearance. Plastic-shielded "Lume-Glow" series includes eight luminaires and the matching 2-lamp and 4-lamp units are available in 4- or 8-ft lengths. Lamp types which may be used are T-12 medium bi-pin, T-12 rapid start and T-12 slimline. Recommended for pendant mounting, units are constructed with a one-piece, die-formed 20-gauge steel body channel finished in heat resistant baked white enamel. Unit may be mounted either individually or in continuous rows.

Mitchell Manufacturing Co., 2525 N. Clybourn Ave., Chicago, Ill.

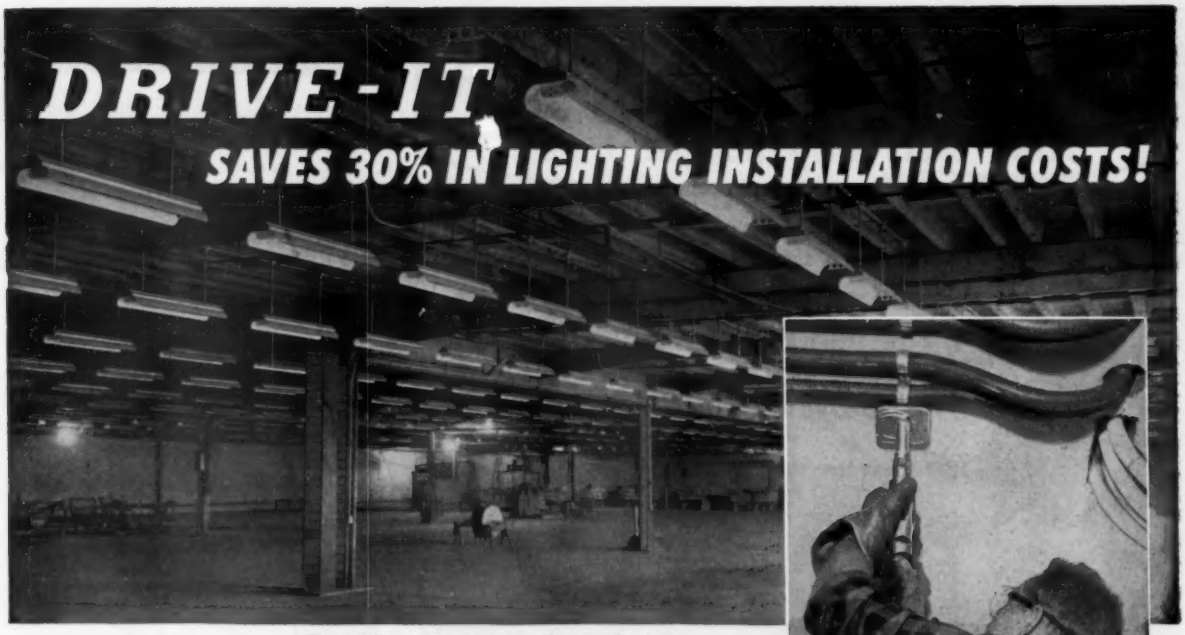
Miniature Lamp (48)

Development of a new type of miniature lamp to be used for indicating purposes on "hot" appliances. Lamp consists of a small glass bubble sealed around a coiled filament, with two rigid pins protruding at the base. New construction employs two bare wire pins for electrical contacts. The lamps terminals, or pins, will plug into appliance sockets in much the same manner that an electronic tube is inserted in a radio receiver. Because of its resistance to heat, the lamp can be used on appliances where lamps were impractical before. Although new construction is expected to be adapted eventually to a wide range of miniature lamp types and sizes, it is being made available at first in .25-volt, half-amp, 3000-hour life lamp. Bulb is $\frac{7}{32}$ths of an inch in diameter, and has a maximum overall length of $\frac{11}{32}$ths of an inch.

General Electric Company, Nela Park, Cleveland 12, Ohio.

DRIVE-IT

SAVES 30% IN LIGHTING INSTALLATION COSTS!

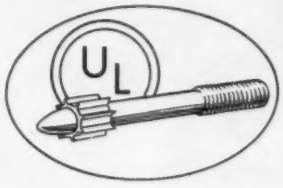


Electricians in new Northwest factory use DRIVE-IT 320 for overhead installations. 18,000 pins were used on fixtures and leads.

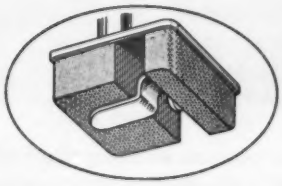
NEW EXCLUSIVE

DRIVE-IT 320 WITH BREAK-OPEN ACTION

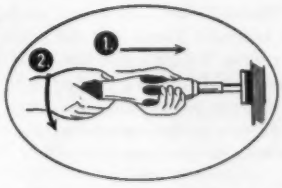
Snap open action results in the fastest operating tool on the market. Easiest method to load and eject cartridges under any condition.



Drive pins are Underwriters' Laboratories approved.



Exclusive Safety Pads developed for specific jobs such as conduit clamp, brackets, or fuse boxes.



Three-way Safety. Cannot be discharged accidentally, due to the push and turn firing sequence. This, plus the large, swivel safety pad, makes DRIVE-IT triple safe.

More fastenings per hour with this speedy way of loading and ejecting cartridges.

DRIVE-IT
the original **POWDER-ACTUATED TOOL**

SEND THIS COUPON FOR FULL DETAILS

POWDER POWER TOOL CORP.
Dept. I, 7526 S.W. Macadam Ave., Portland 1, Ore.
Canada: Ammo Power Tool Co., Ltd.
735 Broadway, Vancouver, B. C.

☐ Please send FREE catalogue and literature.
☐ I want a FREE demonstration of *DRIVE-IT*.

Name_____
Street_____
City_____ State_____

WHAT! A PROPELLER FAN THAT DELIVERS 250,000 cfm!

Yes—they're doing BIG ventilating jobs at propeller fan costs with this wide line of "Buffalo" fans!

- 8" to 120" sizes!
- Easy low-cost installation!
- Shipped completely assembled as a "Package".
- All high in efficiency! —for example, this 96" "Buffalo" Propeller Fan at right delivers 80,000 cfm at ¼" s.p. with a 15 h.p. motor!

From the smaller NV-Breezo Fans (8" to 24" sizes) to the Heavy-Duty NV (24" to 96" sizes) and Belt-Air Fans (24" to 144" sizes), there's a fan or combination of fans to ventilate everything from a small room to an entire plant—easily and economically. What's more, this broad "Buffalo" line offers you models for high temperature exhausting, for handling corrosive fumes and for static pressures all the way up to 1". Installation, of course, is simple and fast—just mount these husky, square-paneled packages in square wall openings. And with every "Buffalo" Fan, you get a bonus in quiet, efficient performance for extra years. It's the "Q" Factor*, developed over our 78 years of fan manufacturing. Write for catalogs today and pick the fan you'll always be glad you ordered.

**The "Q" Factor—the built-in quality which provides trouble-free satisfaction and long life.*

"Buffalo"

BUFFALO FORGE COMPANY

520 Broadway Buffalo, N. Y.

PUBLISHERS OF "FAN ENGINEERING" HANDBOOK

Canadian Blower & Forge Co., Ltd., Kitchener, Ont.

Sales Representatives in all Principal Cities

PROPELLER FANS
BREEZ-AIR ATTIC FANS

BELTED VENT SETS
"L" BREEZO FANS

INDUSTRIAL EXHAUSTERS
"E" BLOWERS

Product Briefs

(49) A lineal **heater**, called Line-O-Heat, prevents freeze-up of water pipes, pumps, roof valleys, eaves and house gutters and is manufactured by Smith-Gates Corp., Plainville, Conn. . . . (50) A new miniature **outlet** designed to simplify multiple outlet installation and wiring has been added to the line of Alden Products Company, Brockton, Mass. . . . (51) Librascope, Inc., Glendale, Calif., has announced a new **magnetic amplifier** line, developed for use in control systems where a high gain amplifier and fast response is required.

(52) An improved station-type **lightning arrester**, Type SV, containing a new safety pressure-relief device is now available from the Westinghouse Electric Corp., Pittsburgh, Pa. . . . (53) The Eraser Co., Inc., Syracuse, N. Y., has announced Model "L-1" rotary **wire stripper** for removing film insulation. . . . (54) A new recessed male **receptacle** has been added to the line of electrical wiring devices manufactured by Leviton Manufacturing Co., Brooklyn, N. Y.

(55) Multi-Amp Corporation, Newark, N. J., has announced the development of a new **test instrument** for checking and calibrating reclosers. . . . (56) Development of a new completely-sealed subminiature **snap-action switch** has been announced by Micro Switch, Freeport, Ill. . . . (57) A magnetically operated, glass enclosed, dry-reed **switch** with an operating time of one millisecond or less, originally adapted for the aviation industry has been developed by Rever Corporation of America, Wallingford, Conn., for general industry application where a sensitive control element is required.

(58) Philadelphia Gear Works, Inc., Philadelphia, Pa., has developed a new and improved line of Hi-Speed **gear units** for speed reduction and increaser service. . . . (59) Two new heavy-duty, industrial-type **flashlights** have been announced by National Carbon Company, New York, N. Y. . . . (60) Safety Nail Driver Corp., Clifton, N. J., has introduced the Safe-T-Matic **nail driver** for driving masonry nails into concrete, cinder blocks, concrete blocks, light and medium gauge metals.

(61) Industrial Engineering Equipment Co., Davenport, Iowa, has developed two new **accessories** for use with the portable hydraulic puller. They are the Quicklink chain attachment and a set of 10 ramp adaptors. . . . (62) New magnetic **voltage regulators** are available in capacities of 15, 30, 60 and 120 VA from Sorensen & Co., Inc., Stamford, Conn. . . . (63) Infinitely variable speeds from a constant speed motor are possible with the new Hi-Lo automatic **pulley** built for use on automatic typewriters, conveyors, packaging machines and other motor driven appliances by Equipment Engineering Co., Minneapolis, Minn.

CATALOGS and BULLETINS

(64) FLOOR BOX and accessories are described in catalog 600, 20 pages, which also lists many wiring specialties. Fullman Mfg. Co.

(65) TRANS-LIGHTED CEILINGS ARE discussed in detail in a new 16-page brochure that gives typical installations; light, sound and air conditioning data; and complete specifications for the Acusti-Luminus lighting equipment. Luminous Ceilings, Inc.

(66) HIGH VOLTAGE CABLE splicing and terminating. Form 990, 8 pages, gives step by step instructions for working with rubber-jacketed cable; multi-color drawings. Simplex Wire and Cable Co.

(67) COIL FORMS, over 2000 different shapes and sizes, are tabulated in a new Arbor List which gives all significant information needed for selection. 12 pages. Precision Paper Tube Co.

(68) ELECTRICAL PRECIPITATORS for processing industries and utilities are discussed in a 28-page bulletin giving types of equipment used, theory of operation, and numerous applications. Research-Cottrell, Inc.

(69) MARKING TAPE which protects written inscriptions under an integral plastic coating can be marked with pencil, stylus or ball-point pen. Folder 5. Labelon Tape Co., Inc.

(70) DISTRIBUTION TRANSFORMERS. New line of 3- to 167-kva single-phase, pole-top transformers is detailed in booklet B-6403; construction features, installation, operation and maintenance are covered. Westinghouse Electric Corp.

(71) PANELBOARDS for lighting and distribution are the subject of 24-page bulletin 501. Information includes applicable federal specifications, construction design and complete engineering data. Continental Electric Equipment Co.

(72) FANS, HEATERS and dehumidifiers including a new 20-in. reversible window ventilator are listed in the 1955 catalog of Berns Mfg. Corp.

(73) OIL-TIGHT PUSHBUTTONS, selector switches, and accessories are described in 16-page bulletin GEA-5779B which gives product features, prices, and complete ordering information on equipment. General Electric Co.

(74) PIPE CHUCK for threading machines grips pipe tightly in either direction, is adaptable to old threaders. 6-page folder gives design and operation. Beaver Pipe Tools, Inc.

PROOF of HOLDING POWER . . .

AFTER 20 YEARS OF OUTSIDE EXPOSURE

BRICK BREAKS

But RAWLPLUG HOLDS

RAILROAD ELECTRICIAN SAYS:

"I am sending you a sample (see photo above) of what they (Rawlplugs) are capable of doing . . . We were removing some old conduit from an outside wall and this piece of brick was pried off with the 1" conduit used as a lever.

I cannot remember how long these plugs had been installed, but believe it to be between twenty and thirty years."

J. G. COLWALL, Montgomery, Alabama

When you require maximum holding power and the least drilling time (you drill smaller holes) use Rawlplugs.

VOTE HERE . . . GET SAMPLES . . .

Request samples by attaching coupon below to your business letterhead.

MARK X for the products you have used.

MARK ✓ for the products you have not used and of which you would like to have samples.

☐ RAWLPLUGS: Universal screw anchor for any material. The original fibre plug for wood and lag screws.

☐ RAWL-DRIVES: Drives like a nail into a drilled hole. Holds like a bolt. Use only in hard materials.

☐ RAWL-TAPERS: A machine screw anchor that fits the hole drilled either by a new or worn drill.

☐ RAWL TOGGLE-BOLTS: For anchoring any fixture or utility in hollow walls or ceilings.

☐ RAWL CARBIDE DRILLS: Spiral precision tool for rotary drill or hand brace. Sizes 5/32" to 1 1/2".

☐ RAWL HAMMER-SETS: Heavy duty threaded type machine bolt anchor.

☐ RAWL-ANCHORS: For holding bolts permanently in materials such as concrete, marble, stone, brick, etc. Heavy duty type.

☐ RAWLDRILLS: For drilling holes in all masonry. Easily sharpened. For hand and power drilling.

☐ DIMENSIONAL CHART of above products

SUPPLIER .....

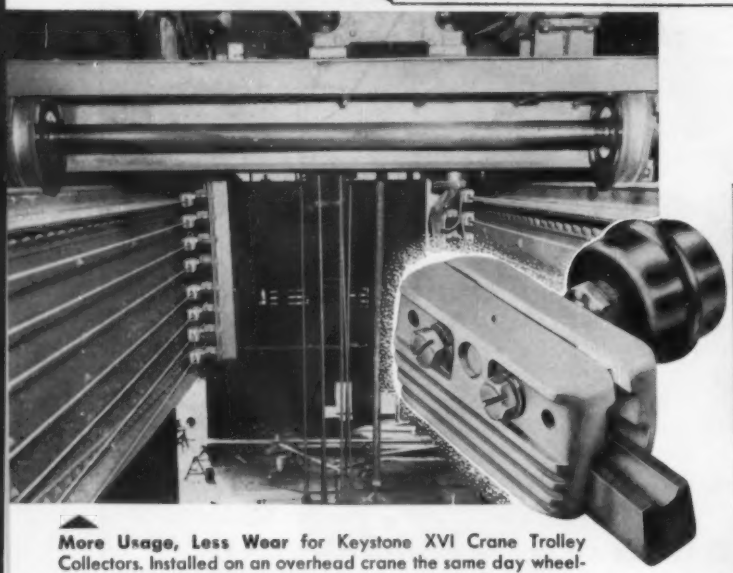
THE RAWLPLUG COMPANY, Inc.

271 CHURCH STREET • NEW YORK 13, N. Y.

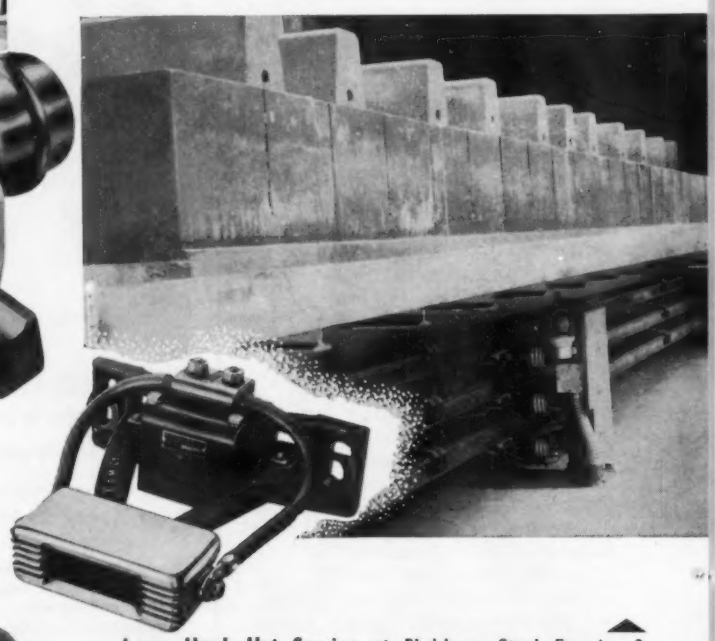
Drop all your

The ELECTRIC SERVICE

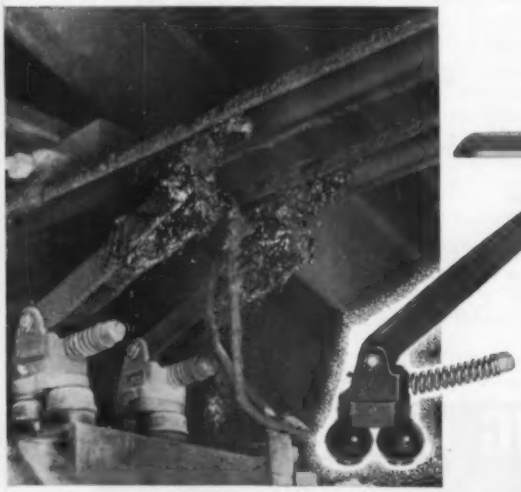
1. Design New
2. Modernize
3. Recommend



More Usage, Less Wear for Keystone XVI Crane Trolley Collectors. Installed on an overhead crane the same day wheel-type collectors went on a similar crane, they were in operation 50% longer each day. When wheels were removed due to failure, the XVI renewable carbon shoe contact inserts still had many months of life ahead.



Long, Hard, Hot Service at Birdsboro Steel Foundry & Machine Co. Loaded furnace cars move in and out of heat treating furnaces safely and without a hitch. Rails on each furnace car contact stationary columns equipped with Keystone LMI Pony-size Contact Rail Collectors. These reversible collectors offer 30% greater contact travel, efficient current transfer.



Rugged Reliability in the face of dirt, rainy and icy conditions, and severe misalignment. These Keystone Inverted-V Universal Collectors have operated for more than seven years at the Alan Wood Steel plant. They give positive contact wherever the going is rough, tough, and dirty—in open hearth, coke plant, blast furnace.

ELECTRIC SERVICE MANUFACTURING CO.,

third-rail problems on his desk!

Engineer will collaborate and . . .

Keystone Conductor System (Steel, Aluminum or Copper)

your Present System for Greater Efficiency and Economy

Suitable ESM Equipment for the Job

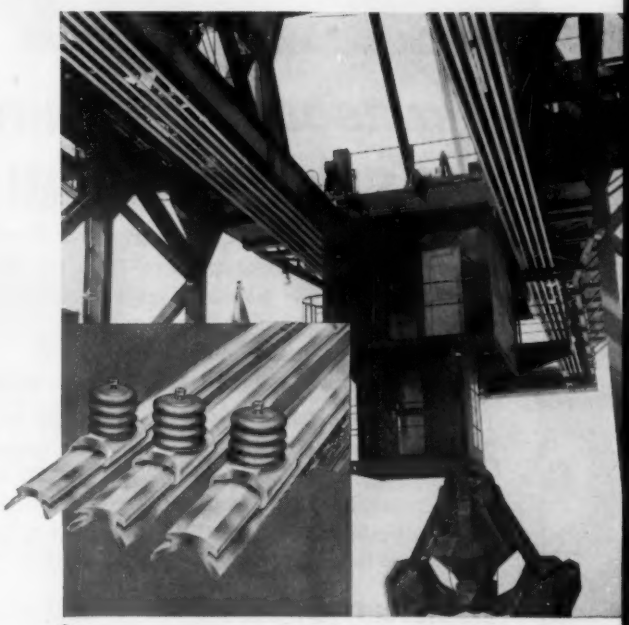
INDUSTRIES rely heavily on the Electric Service engineer for designing or converting power Conductor Systems. There are three main reasons:

ESM ALUMINUM, STEEL, COPPER SYSTEMS—All three are designed and built by Electric Service. Each has its proper applications, resultant economies. The system specific to *your* needs is recommended without bias.

ESM SERVICE IS COMPLETE—Engineering counsel is backed up by the complete line of Keystone Equipment and by ESM installation specialists. Electric Service engineers new systems, modernizes inadequate systems, repairs existing systems.

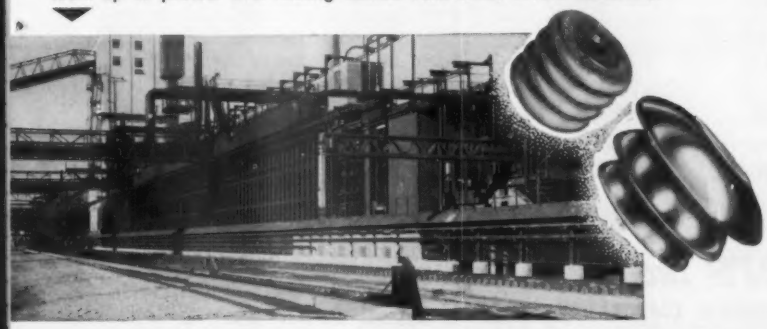
ESM PRODUCTS ARE JOB-PROVED—They're at work on all types of materials handling equipment in every industry—steel mills, power plants, docks, rail yards, processing plants. Typical installations shown here illustrate the scope and reputation of Electric Service in this electrical power-transmission field.

What's your problem?—insufficient power? . . . severe weather or corrosion conditions? . . . production-sapping shutdowns? . . . excessive maintenance? Write today for assistance.



Keystone Integrated Aluminum Conductor System reduces corrosion, cuts deadweight at Canton Co. Baltimore installation. High-speed ore unloader utilizes aluminum on trolley conductors and on 1200-ft., 2300-volt main runway. Aluminum Under-running System has high current capacity, low voltage drop, sensitive control.

Unhurt by Volts, Jolts are the Keystone Insulators on Fairless Works coke oven rails. Petticoat-type Porcelain Insulators resist contamination by dirt, moisture. Shock-proof, non-absorbent moulded type Insulators team up to protect over-running contact rails under severe conditions.



KEYSTONE
INDUSTRIAL
POWER
PRODUCTS

Philadelphia 32, Pa.

Represented in Canada by Lyman Tube and Bearings, Ltd., Montreal and Toronto

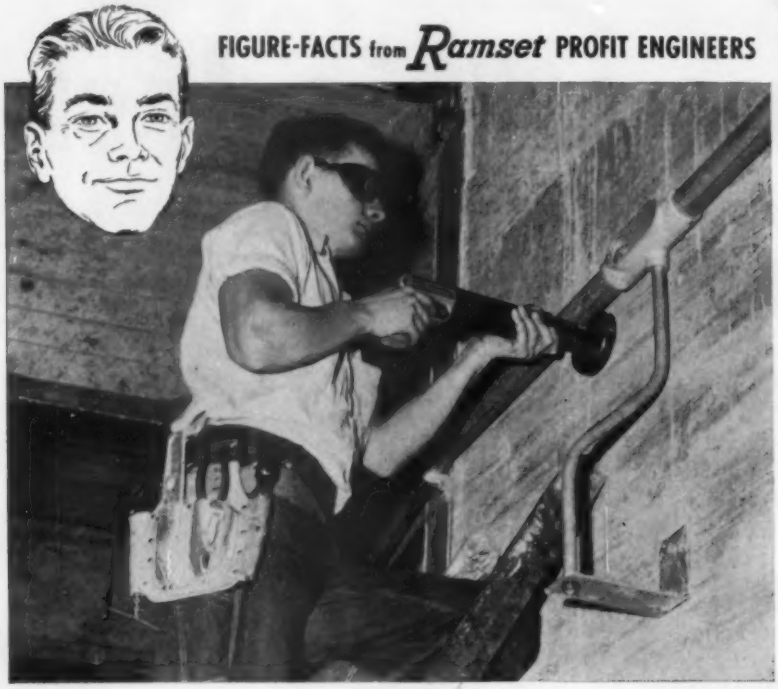


FIGURE-FACTS from *Ramset* PROFIT ENGINEERS

Ramset PROFIT ENGINEERING SAVES SUBWAY 90% INSTALLATION TIME

Contractor W. P. Pangbourne, by using RAMSET SYSTEM, reduced by 90% the time required to fasten electric conduit in Philadelphia's new 4-mile Market Street subway extension. Worker fatigue also was greatly reduced.

Ramset fastens to concrete and steel—*quicker, easier, better*

Compact, lightweight and free of wires, hose or attachments, the RAMSET JOBMASTER makes easy work of former drudgery-jobs. Optional one-hand operation makes scaffold and ladder work easier, faster, less tiring. Pin-point accuracy of Roto-set Shield and Tru-Set Fasteners produces close-to-perfect alignment with more than ample holding power.

Increase YOUR PROFIT MARGINS with *Ramset* FASTENING SYSTEM

Electric installations of all kinds move along faster with RAMSET SYSTEM. Competitive bids can be lower and profit margins increased. Your nearby RAMSET Dealer will gladly help you "profit engineer" your projects, whether now underway, or in planning stage.

Ask your RAMSET Dealer or write for Application Bulletin E-1, with detailed drawings and specifications for your anchoring work.

Ramset Fasteners, INC.

RAMSET DIVISION • OLIN MATHIESON CHEMICAL CORPORATION

12105 BEREA ROAD • CLEVELAND 11, OHIO

(75) STAGE LIGHTING SWITCHBOARDS are discussed in 24-page bulletin GEA-6168 which gives various types of available equipment, their operation, and the lighting effects achieved with each. General Electric Co., Distribution Assemblies Dept.

(76) SHIELDED WIRE AND CABLE for microphone and sound system use. Bulletin SW-1, 8 pages, lists physical and electrical characteristics of several types and sizes. Whitney Blake Co.

(77) POLE LINE HARDWARE. Complete specifications and blueprints of revisions and additions to the firm's line of drop-forged steel and aluminum hardware for high voltage transmission lines are contained in a 14-page supplement. Brewer-Titchener Corp.

(78) SWIMMING POOL LIGHTS and pumps are two of the lines listed in a comprehensive reference and data catalog on pool construction and maintenance equipment. 44 pages. Modern Swimming Pool Co., Inc.

(79) POWER PLANTS for battery charging are available in 6-, 12-, 24- and 32-volt models with ratings up to 2200 watts. Illustrations and specifications of the complete line is compactly presented in 4-page folder, FRE-1. Universal Motor Co.

(80) INDUSTRIAL SOLENOIDS. 16-page bulletin GEA-6215 gives force and current curves and dimensions of the new line of strongbox solenoids; also cross-reference chart equating new models with former line. General Electric Co.

(81) POWER CONNECTORS for aluminum and copper conductors as well as tubing, bar, and cable connectors and terminal lugs are listed in a new catalog featuring an extensive data section for estimating and planning. Delta-Star Electric Div., H. K. Porter Co., Inc.

(82) RELAY SELECTION TABULATIONS, a 2-page sheet, gives make, break, and continuous capacity ratings of ac and dc relays; also application data and wiring diagrams for various available units. Pub. 553. Automatic Switch Co.

(83) INDUSTRIAL TV HOUSINGS, designed to protect cameras operating in explosive or extreme outdoor conditions, are described in catalog sheet E.55. Radio Corp. of America, Engineering Products Div.

(84) ANCHORING DEVICE for hollow walls is called Wallgrip. Consists of screw and split sleeve which expands when screw is tightened. Three sizes —$\frac{1}{8}$, $\frac{7}{16}$ and $\frac{1}{4}$. Prices and specifications are given on sheet DM 120. Rocket Devices Corp.

(85) DC MOTOR features dynamic response design for applications demanding smooth, accurate acceleration and deceleration as well as shockless

starting and stopping. Available in 15 ratings from 7½ to 250 hp. Bulletin C-2002, 12 pages, gives engineering data and explanations of construction. Reliance Electric and Eng. Co.

(86) TROLLEY CONDUCTOR SYSTEM for electrification of cranes and monorails has figure-eight shaped hollow conductors enclosed in plastic casing. Catalog 8-54 contains 25 pages of data on selection, installation and maintenance of the equipment. Insul-8-Corp.

(87) PANELBOARDS. Nine new bulletins are available, each describing a single style of unit with dimensions and ratings for all sizes. General Electric Co., Distribution Assemblies Dept.

(88) SWITCHES for a wide range of actuating operations are listed in 20-page catalog 101a which gives electrical ratings, dimensions and characteristics of 21 different types. Prices are included. Micro Switch.

(89) DISTRIBUTION TRANSFORMERS with integral protection against lightning, overloads or short circuits are available in five types in ratings of 3 to 100 kva, 2400 to 14,400 volts. Bulletin 61B7309B, 8 pages. Allis-Chalmers Mfg. Co.

(90) SAFETY EQUIPMENT catalog includes personal protective clothing and industrial safety devices. General Scientific Equipment Co.

(91) PROTECTIVE ATMOSPHERES prevent deterioration of metals during heat-treating. GEA-5907, a 12-page bulletin, explains four basic types of gas-producing equipment, includes tables for selecting proper gas for each application. General Electric Co.

(92) THINWALL ELBOWS, large radius rigid conduit elbows, goosenecks, pipe or rod running thread and wall plates are new additions to the line listed in catalog 203, 8 pages. Conduit Nipple Manufacturing Co.

(93) DISTRIBUTION EQUIPMENT, 24-page bulletin GEA-6126 gives design features and advantages of self-protected, pole-type distribution transformers rated at 100 kva and below. Bulletin GEA-6208, 20 pages, describes new line of enclosed fuse cutouts with technical data and dimensions. 50- and 100-ampere cutouts in 5.2-kv and 7.8-kv ratings are included. General Electric Co.

(94) AUTOMATIC CONTROLS, including multi-pole contactors and timers, are listed in an 8-page supplementary bulletin. Zenith Electric Co.

(95) DIAL INTERCOMS for office and factory. Catalog sheets Tel-119 to Tel-124 describe various components, give capacities and features. Telecom, Inc.

(96) LIGHTING FIXTURES. Catalog 55 gives illustrations of complete line of incandescent and fluorescent units.

ELECTROMODE

WORLD'S MOST COMPLETE LINE

√ All-Electric HEATERS

√ Electric HEATING SYSTEMS

100% SAFE

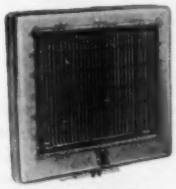
Only ELECTROMODE has the sealed-in CAST-ALUMINUM HEATING ELEMENT. No danger of fire, shock or burn. Guaranteed for 5 years. Built-in safety switch prevents overheating. *Approved by Underwriters' Laboratories.*

For More Than A Quarter Century Electromode Has Specialized in One Specific Industry

HEATING BY ELECTRICITY

ALL YOUR REQUIREMENTS FROM ONE RELIABLE SOURCE

Safest TO USE.... Easiest TO INSTALL



PANEL HEATER

Combines principles of radiant and convection heating. Unbreakable (no glass or ceramics). 1100 watts, 120 or 240 volts.

- Automatic
- Fan-Circulated Heat
- Capacities For All Size Rooms

MODEL WJA

Wall-type Bathroom Heater

MODEL WA

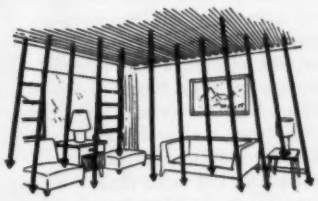
Wall-type Down-flo Heater

BASEBOARD HEATER

Low-Level Perimeter Heat spreads a shield of comfortable warmth against cold walls from floor to ceiling.

Basic Unit: 32" long, 8½" high, 3" wide, 600 watts, 120 or 240 volts. Blank sections, end-pieces and corners available so that an unbroken baseboard effect may be carried out in any size room.

CEILING *Radiant* CABLE HEAT



Electromode Heating Cable installed in ceiling radiates clean, sunlike heat downward. Has Magic Seal coating which prevents streaks on ceiling when cable is embedded in plaster. Automatic temperature control by separate thermostat for each room.

ELECTROMODE UNIT HEATERS

Solve HARD-TO-HEAT AREAS in the PLANT and ISOLATED LOCATIONS

Easy to Install

No Plumbing Required

Suspension Type 10,000 to 45,000 watts 34,150 to 153,675 BTU

Portable and Suspension 1,500 to 7,500 watts 5,122 to 25,613 BTU

Safe HEAT for HAZARDOUS AREAS

Explosion-Proof 2000, 4000, 6000 watts 6830 to 20,490 BTU

Conform to rigid safety specifications and are fully tested and approved for use in areas covered by Class 1, Group D.

ELECTROMODE CORPORATION Dept. EC 25

45 CROUCH STREET, ROCHESTER 3, N. Y.

Send us FREE Electric Heating File, containing specifications, illustrations, installations, prices and how to figure electric space heating. We are interested in:

Name.....

Address.....

City.....Zone.....State.....

☐ Home and Office Heaters

☐ Industrial Unit Heaters

☐ Explosion-Proof Heaters

Reader's Quiz

QUESTIONS from readers on problems of industrial equipment, installation, maintenance and repair. Answered by electrical maintenance engineers and industrial electrical contractors out of their experience. For every question and every answer published we pay $5.00.

Electrical Maintenance

QUESTION F27—We have a large factory operation with over 700 motors spread through a large group of buildings. At the present time, electrical maintenance is handled on a centralized basis. We are considering the establishment of area maintenance stations. Which are best?

Management frowns on the area plan pointing out that much time will be non-productive for the assigned electricians. Our argument is this permits them to become thoroughly familiar with the specialized equipment and processes. Also there is the matter of the "personal" interest angle, from regularly assigned electricians, looking after the equipment, which cannot be actually evaluated.

Perhaps there are other arguments, pro and con, for these proposals that we have not listed. What are they?—L.W.F.

ANSWER TO F27—We have a plant which has over 3,000 motors and operates on an area maintenance system. Each area is under responsibility of a permanently assigned foreman. However, the electricians assigned to him are on a rotating basis. They remain with each area foreman for six weeks. In this way we have the benefit of a centralized system in which all men become familiar with plantwide operations. With the foreman permanently assigned to an area, he assumes the responsibility of the specialized equipment in his area and becomes thoroughly familiar with it.

This system appears to work out well in that the foreman, who is a responsible individual, is concerned with his area only, and can instruct and guide the electricians under his control.

We have also set up our rotation system in such a way that part of the electricians in the gang are assigned to maintenance and part to construction. This gives us wide flexibility and does not impose limitations on our operation, since foremen are the specialists and electricians can then be used wherever they are needed.—R.E.B.

ANSWER TO F27—It has been my experience that the central method is usually used except in those locations where there is a large concentration of electrical equipment. At the large concentration of electrical equipment there always was enough maintenance work to keep the men assigned there busy. They were under control of central office. This saved a lot of traveling time to central office and made the men doing the work more familiar with the equipment. At the other locations where there was not enough work to keep the men reasonably busy all the time, they were supervised directly from the central office by telephone to new locations as necessary.—E.B.

Fused Disconnect Switches

QUESTION G27—When opening and closing 33,000-volt fused disconnect switches, what methods are considered safest? Should the operator stand on an insulated platform; what length should the stick be; should a rain shield be used; and if so how grounded?—M.D.

ANSWER TO G27—In the operation of 33,000-volt fused disconnect switches with a hook stick, an insulated platform may be safely used under certain conditions. These are if weeds or trash accumulations are not present under or near the platform; and if the insulators are not cracked or broken from rough usage.

An insulated platform, because of its weight, is unwieldy to move between the different switching positions in the switchyard. For this reason, the operator may do his switching without it and thereby hazard his safety. In the absence of the insulated platform, a good pair of hot gloves should be used with the hot stick.

When a metal rain shield is used, it should be placed high enough on the handle so that his hands will not easily touch it during the switching operation. The rain shield should be attached to a suitable ground by a flexible cable or grounding chain.

There is on the market a hot stick which has a micarta tube sealed on the upper end and extending down about 12 inches over the upper part of the handle. This forms a raintight housing over the upper part of the handle and keeps this portion dry during rainy weather. This dry section of the handle together with the moist portion of the stick is considered sufficient to handle 33,000 volts.

The length of the hot stick is usually governed by the height of the switches; however eight feet of length is considered sufficient if the stick is kept well varnished.—W.E.N.

ANSWER TO G27—Our safety department in association with NEC standards has set up rigid rules governing switching procedure.

The insulation platform is not mandatory unless conditions of a conducting nature are present. Also the operator's attire and auxiliary equipment must be considered for personal safety.

The length of the stick is important and should comply with established standards. However it should not be so long as to endanger the life of the operator by forcing him to operate from other nearby energized equipment or to operate from a difficult angle. Therefore there are minimum and maximum limitations. Our minimum at this voltage is about ten feet.

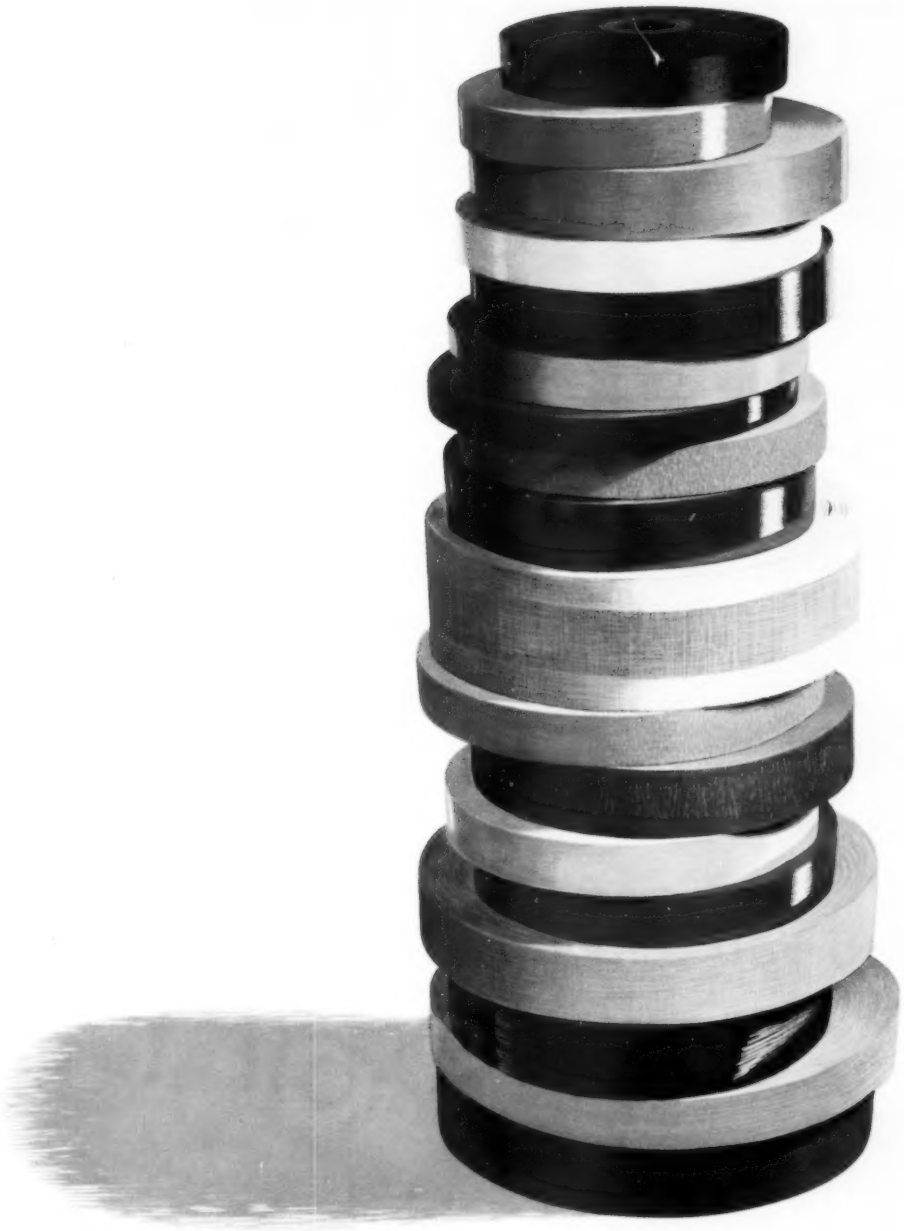
The rain shield which is usually grounded to the existing station ground is again not mandatory unless switching in inclement weather is sanctioned and quite frequent.—J.B.K.

Protecting 3-Phase Motors

QUESTION H27—What would be the best way to protect 3-phase motors from single-phase fault on a system which has single-phase 4160-volt primary, Scott-connected transformers? The neutral ground is run from the main substation to make the 3-phase current. The main transformers are Y connected at 4160-volts. The secondary is open delta, 3-phase, 440-volts. On one occasion the primary neutral opened at the station and single phased the secondary, which burned out a motor. The magnetic contactor was found to be welded at the contacts.—E.S.H.

ANSWER TO H27—Use a relay that opens immediately upon single phasing; this relay to open the motor starter. Another method is to use Fusetrons at no higher rating than the motor full load. Upon single phasing they will blow.—W.E.G.

ANSWER TO H27—A special timer that will force the magnetic contactor to operate not more than four times per minute will keep the contacts from



whatever the job . . .

SELF-STICKING

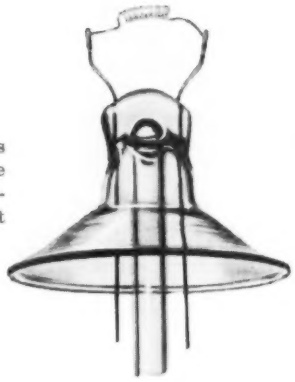
PERMACEL® TAPES

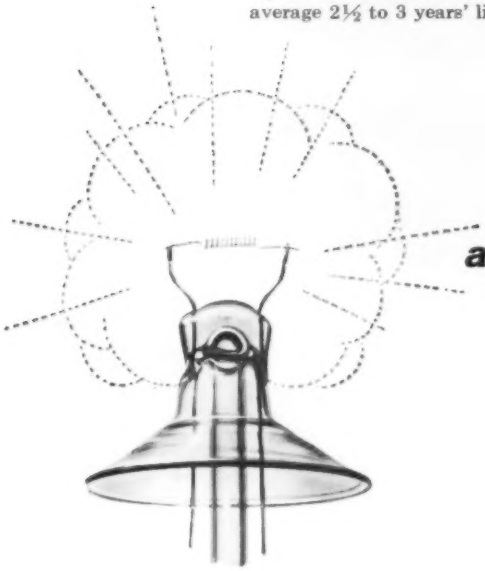
In our complete line, there's a self-sticking tape for every job . . . write Permacel Tape Corporation, New Brunswick, N. J.

Backing up the famous SYLVANIA money-back offer...

a full measure of coating...

Every Sylvania fluorescent filament receives this precise amount of Sylvania's patented long-life cathode coating—the coating that raised industry standards threefold—gave you lamps that average 2½ to 3 years' life.





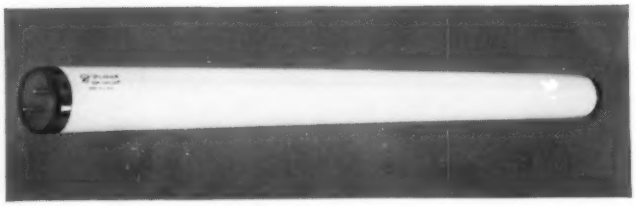
a stream of air...

Now—to give you more for your lighting dollar—Sylvania carefully removes the excess coating and spreads it out in a smooth, uniform film. A controlled stream of air does it—leaves a uniform coating that won't age irregularly—won't flake off before its time.

...to bring you Sylvania's bonus of light

Sylvania's never-ending stream of improvements in fluorescent lamps is unequaled. That is why Sylvania can offer you a signed money-back offer of better results than any other fluorescent lamp. Thousands of users have switched to Sylvania—taking advantage of this famous money-back offer to prove for themselves that Sylvania lamps are better.

Check the uniformity of performance and appearance, the maintained brightness and life of Sylvania lamps against those you are now using. If, in your opinion, they do not outperform your present lamps, send them back with your certificate, and Sylvania will refund the full purchase price. Order a trial lot from your Sylvania supplier today.



SYLVANIA ELECTRIC PRODUCTS INC.
1740 Broadway, New York 19, N.Y.
In Canada: University Tower Building
St. Catherine Street, Montreal, P. Q.

LIGHTING • RADIO • ELECTRONICS
TELEVISION • ATOMIC ENERGY

Keep your eye on SYLVANIA

...fastest growing name in sight

getting welded. Three midget relays that are designed to close the circuit on not less than 80% of the circuit voltage, their coils connected to form a delta between the 3-phase leads, and their normally open contacts connected in series with each other, and in series with the main contactor coil will protect the motor, under conditions when the contactor coil draws power between phase A lead and the ground. While loads on phase B and C take power through the motor winding to the ground. The motor relay can't protect the non-revolving motor.—H.S.

Outlet Valve on Railroad Cars

QUESTION J27—Does anyone know of an especially good type of heater or method of thawing the outlet valve on the bottom of oil tank railroad cars in severely cold weather?

Due to the difference in specific gravity, most of the condensation or water settles into this valve.

The shape is such that a heating cable cannot be well attached, and an electric heater is far from being ideal. It is slow to operate and also oil drips onto the heater.—M.C.T.

ANSWER TO J27—One of the safest, most effective methods of thawing tank car outlets is the use of steam. If a steam line is not available near the unloading track, portable steam generators are available which will furnish dry steam for thawing, cleaning, etc. Where any amount of defrosting is done, they make a wise investment.

Incidently, one way to escape freezing at the bottom outlet valve is to unload from the top down. This method also results in increased fire safety, as a broken connection will not result in the entire carload dumping on the ground.—D.H.N.

ANSWER TO J27—The proper answer to this depends on how many cars are involved, and therefore how expensive a method would be justified, but one effective method, without any fire hazard, would be to keep a small portable electrically heated steam cleaner on hand. An oil fired cleaner is also commercially available. The nozzle of the cleaner is easily handled and should thaw a valve in a minute or less.—E.A.McF.

Plug Fuses

QUESTION K27—We have a condition where we are operating a circuit at pretty well full load with momentary overloads not exceeding 10% of the fuse rating. The fuse is a 20-amp plug-

...helps select the proper tools to save hours, cut costs on electrical work

Minutes are money on every job you have in work today. And GREENLEE helps you save large units of time with tools designed especially to simplify and speed electrical installations.

Perhaps you already have some or many of these excellent tools on your jobs today. But there may be some of them that you've been overlooking or haven't heard about.

That's why we've prepared this new GREENLEE file on this equipment. Shows how you can save time on conduit bending, cable pulling, enlarging knock-out openings, boring holes in wood for conduit and pipe, joist boring, etc.

Send coupon below for your copy of this new GREENLEE reference file which describes timesaving electrical tools in detail.

TOOLS FOR CRAFTSMEN
GREENLEE

GREENLEE TOOL CO., 1742 Columbia Avenue, Rockford, Illinois

Please send me the new GREENLEE Electrical Tools Reference File E-212.

Name_____

Company Name_____

Address_____

City_____ State_____

FLUSH INSTALLATION

above all else

CUT OVERHEAD GLARE

specify...

marlou

"NEVA-GLARE"

LIGHTING FIXTURES
with Plexiglas Diffuser

Easy to install • Easy to clean and maintain

Solve your lighting problems with "NEVA-GLARE" fixtures—diffused, glare-free yet bright lighting, that makes for relaxed efficiency. You will know the moment you turn them on.

MARLOU'S new line of "Neva-Glare" Plexiglas units are opthalmically designed to diffuse light evenly with an absolute minimum of light absorption. "Neva-Glare" fixtures are made to blend into the surroundings and the Plexiglas is easily removed for cleaning and maintenance, no tools required.

Available in square or rectangle units that are adaptable for flush or recessed installation. E.T.L. Curves on request

"Above all else...MARLOU is Quality Lighting".

Some select territories open to recognized Manufacturers Agents

RECESSED INSTALLATION

ARCHITECTS - BUILDERS
Specify "NEVA-GLARE" the modern way to modern Lighting.

marlou
LIGHTS, INC.
FANWOOD, NEW JERSEY

A complete line of lighting fixtures for Fluorescent, Slimline and Cold Cathode Lights.

Write For Complete MARLOU Catalog # 1001

in type of fuse, 115 volts ac. Quite frequently the fuse goes, and when we put in another fuse, the circuit behaves properly again.

When a plug fuse is operated at or slightly beyond its capacity for any length of time, does the fuse tend to go at a lower current rating later on or what exactly happens? I have heard of fuse embrittlement, but there is no vibration here.—H.H.S.

ANSWER TO K27—Fuses are heat devices, designed so that a fusible link of metal will melt when the current in the circuit reaches a specified value. There is a certain amount of heat generated in every conductor as the result of I^2R power losses, and in a fuse this heat is used to melt the alloy link.

Naturally, since the heat is dependent on the square of the current, it rises rapidly as the current increases. A fuse operated at half load will generate heat. A fuse operated just above rated current may not blow for several minutes, or possibly for several days, because the heat builds up slowly, yet the sudden heat of a short circuit will blow the fuse apart in an instant.

Since heat actually melts the fuse, the fuse enclosure and ambient temperature will have some effect on how quickly the fuse will blow. While this generally does not interfere with fuse operation, on circuits loaded nearly to capacity a poorly ventilated fuse may blow where an open fuse will not.

Continuous operation at full load or frequent overloads will raise fuse temperature sufficiently to crystallize the link. When this occurs, fuse life is shortened, and a failure may occur even though there is no overload.

On circuits with motor loads where starting currents are well above normal running currents, dual element fuses are frequently necessary to prevent failures. They carry the starting currents safely, yet blow on any sustained overloads or short circuits.—D.H.N.

Synchronous Generator

QUESTION L27—If a synchronous condenser or a synchronous motor were connected to a system fed from a synchronous generator and an induction generator, could the synchronous generator be taken off the system for maintenance purposes without shutting down the system? Assume that the induction generator is not overloaded and synchronous condenser or synchronous motor large enough to supply the excitation current the induction generator may need.—E.B.

ANSWER TO L27—The load on the system, that is, the synchronous motor or synchronous condenser, would not continue to operate if the synchronous generator were disconnected, leaving only the induction generator to supply the power. An induction generator depends for its operation on the fact that it is excited from a fixed frequency source. Its rotor must be turned at a speed above that of the revolving field of its stator. Without the frequency regulation of the synchronous generator the synchronous motor would be free to vary its speed. As its speed varied, the induction generator would cease generating. As the synchronous motor inertia caused it to continue to rotate with its excitation still applied, it would become a generator but at diminishing frequency as it slowed down. This variable frequency power fed back into the line could cause transient currents between synchronous motor and induction generator which could do both electrical and mechanical damage.—E.A.McF.

Can you ANSWER these QUESTIONS?

QUESTION X27—Has anyone successfully made a self excited alternator of any size by using the small generated ac voltage due to residual magnetism to start the buildup? Can it be done by connecting to the ac side of a rectifier and connecting the dc side of rectifier through a filter to get steady dc to the field of the alternator? What type of a rectifier and filter is best for this purpose?—E.B.

QUESTION Y27—Can a Heusler alloy be used for the magnetic circuit of a high speed relay?—H.S.

QUESTION Z27 —One large transformer manufacturer sent specifications on a 2400/480-volt transformer, which we are about to purchase. One of the statements made was on regulation, which was 1.1% at full-load, unity power factor, and 3.8% at .8 power factor. Why the difference in regulation when the load remains the same?—M.D.

QUESTION A28 Can any reader suggest a good rule of thumb for choosing between fluorescent, mercury vapor, and incandescent lighting in industrial applications? It seems to be primarily a matter of mounting height, but it is difficult to know where the line should be drawn.—D.H.N.

PLEASE SEND IN YOUR ANSWER BY MARCH 15

R&S EVER-LOK®

Automatic Locking

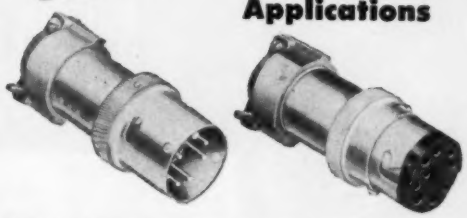
MULTI-CIRCUIT RECEPTACLES • PLUGS • CONNECTORS

5 Amp., 250 Volts, A.C. or D.C.

TWO TO TWELVE POLE—POLARIZED

Type SE

For Industrial Automatic Press and Tool Control Applications



Wherever the modern trend toward automation requires fully automatic product and process control, R & S Ever-Lok multi-circuit plugs, receptacles and connectors provide a happy ending for cord connecting problems. These rugged, dependable automatic-locking multi-circuit devices are quality engineered to carry full-rated load currents safely and easily under the most severe operating conditions.

Write for Sales Data Sheet 1355-4

Type SX

FOR SOUND AND CONTROL EQUIPMENT

● R & S Ever-Lok complete lines are available from Midget type 10 amperes to 200 amperes heavy service types . . . standard or reverse service . . . fused and non-fused types.

C15

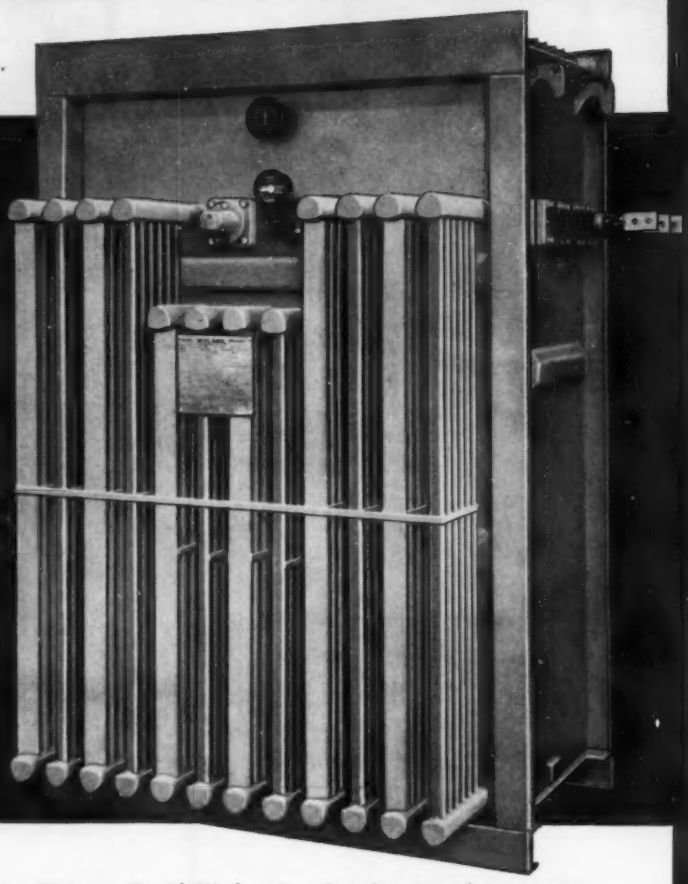
RUSSELL & STOLL COMPANY, INC. • 125 BARCLAY STREET, NEW YORK 7, N.Y.

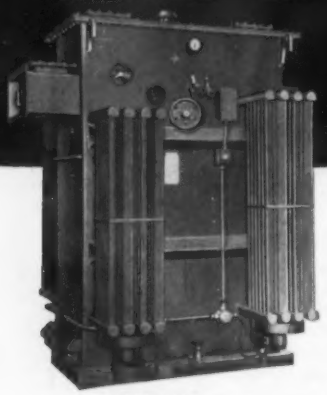
RUSSELL & STOLL

PRECISION-BUILT ELECTRICAL EQUIPMENT—SINCE 1902

Wagner®
TRANSFORMERS
...the choice of leaders in industry

for space-saving load centers... specify Wagner Close-Coupled Unit Substation Transformers





Wagner

THROAT-CONNECTED UNIT SUBSTATION TRANSFORMERS

For outdoor installation, or for applications where it is desirable to locate the transformer away from the switchgear, Wagner can furnish these liquid-filled transformers in ratings to 2000 kva, 15 kv and below. Bulletin TU-13 gives full information.

Now, Wagner liquid-filled unit substation transformers are available in new, improved close-coupled units, rated from 300 to 2000 kva, that can be flush-mounted with any make of switchgear. They can be used in both single and double-ended unit substations to form neat, compact, streamlined substations for modern industrial service.

Bushings are provided on the ends of the close-coupled transformer for connection to the switchgear. The bushing heights are designed for a minimum distance from the base, giving ample room to make connection to switchgear or busses in the switchgear compartment or transition section.

In this type design it is not necessary to coordinate bushing height of transformer and switchgear as in the throat connected units which often require special throat heights to match special switchgear. This feature means that a standard transformer can be used for special switchgear application with a minimum of engineering coordination, resulting in shorter deliveries.

Look to Wagner for better transformers that assure a continuous, dependable flow of power. Your nearby Wagner engineer will be glad to help you solve your load-center problems. Call the nearest of our 32 branch offices, or write us.

Wagner Electric Corporation EST. 1891

WAGNER ELECTRIC CORPORATION
6413 PLYMOUTH AVE., ST. LOUIS 14, MO., U.S.A.

BRANCHES AND DISTRIBUTORS IN ALL PRINCIPAL CITIES

ELECTRIC MOTORS
TRANSFORMERS
INDUSTRIAL BRAKES
AUTOMOTIVE BRAKE SYSTEMS—AIR AND HYDRAULIC

T55-2

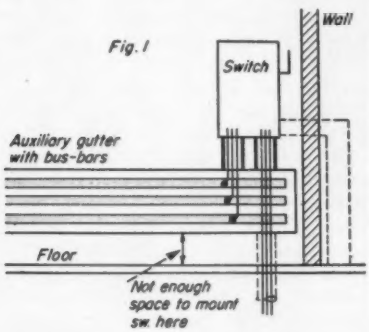
Questions on the Code

Answered by

B. A. McDONALD, *New York Board of Fire Underwriters, Rochester, N. Y.*
GLENN ROWELL, *Electrical Engineer, Fire Underwriters Inspection Bureau, Minneapolis, Minn.*
B. Z. SEGALL, *Consulting Electrical Engineer, New Orleans, La.*

Auxiliary Gutter Problem

Q. *A question which arises very often and one with many different answers concerns passing through or using as a raceway, bussed or unbussed auxiliary gutters. Suppose as shown in Fig. No. 1, the load served*



by the switch is so located that the conduit from the switch to the load must go down under the floor. Is it permissible to feed the switch from the gutter as shown and then use the gutter as a raceway to feed the conduit, shown dotted, to continue the run? Some say as long as the gutter is not a bussed gutter it is O.K. Bear in mind to go around in many cases is impossible, such as when the switch is very close to a wall. The rest of the gutter will of course be loaded with switches and conduit. I cannot find in the Code a rule which prohibits such a layout with either a bussed or unbussed gutter, although I appreciate the fact, the more different circuits are isolated from each other, the better. I might mention here that the gutter shown is too close to the floor to mount the switch underneath.

Also concerning this same problem would two nipples as shown be necessary, one to feed the switch, the other to carry the switch load conductors? I cannot find a rule to cover this.—G.R.G.

A. Section 3741 of the N. E. Code advises us that an auxiliary gutter may enclose conductors or bus bars. I personally believe that the Code did not intend to infer that an auxiliary gutter could enclose both conductors and bus bars. This point might have been clarified by the addition of the word "either" between the words enclose and conductors. If such were the wording, it would then be necessary to provide for the conductor connections to the bus bars. Section 3748 advises us that "tap from bare conductors shall leave the gutter opposite their terminal connections and conductors shall not be brought in contact with uninsulated current-carrying parts of opposite polarity". I believe this Code provision indicates a desire to have the insulated conductors leave the gutter by the shortest path and confirms the opinion that both conductors and bus bars should not be associated to any degree, beyond making a connection, in the auxiliary gutter. I am unable to find any official interpretation covering this question which indicates to me that it is generally understood that we should not have both insulated conductors and bus bars in the same gutter. I further believe that the plug-in fittings designed for busway installation emphasizes this point. If the gutter contained only conductors, I see no objection to feeding through provided the total number and area of the conductors used does not violate the requirements of 3745. In such a case the use of two nipples would not be required since one nipple of a size sufficient for the conductors involved could be used.

In the absence of building construction details which are involved, it is difficult to offer suggestions for solving your problem. I have shown by dotted lines how the conduit might be brought through either the side or back wall and then down to the basement. A junction box could be mounted on the wall and so designed that the conduit running through the floor would clear the gutter. Several solutions appear evident and while they may be difficult or possibly not entirely satisfactory it appears that one of them should be used when the simple way involves a Code violation.—B.A.McD.

Disconnect Switch

Q. *Will a 200-amp rated switch provided with time delay type fuses be suitable as a disconnect switch for a 50-hp, 3-phase, 230-volt motor which is provided with compensator starting devices?—L.H.*

A. Under sub-section c. of Section 4402 of the National Electrical Code, you will note that the use of this switch would be in accordance with the Code requirements, provided the compensator used is capable of interrupting stalled rotor currents of the motor, is provided with a no-voltage release, and is provided with running overcurrent protection not exceeding 125% of the motor full load current rating. As this motor will have a full load current rating of 125 amps, the switch will also comply with Section 4402-3., which states that the separate disconnecting means required for a motor with a compensator type of controller may be a general use switch if the fuses used are rated at not more than 150% of the motor full load current.—G.R.

Grounding and Non-Metallic Sheathed Cable

Q. *According to our interpretation of the Code, non-metallic cable cannot be used with metal boxes and enclosures unless a ground wire is provided to bond and ground the same.*

A few years ago non-metallic cable with a neoprene covering and without a ground wire was manufactured and placed on the market. This cable was designated "Barn" wire by the manufacturer.

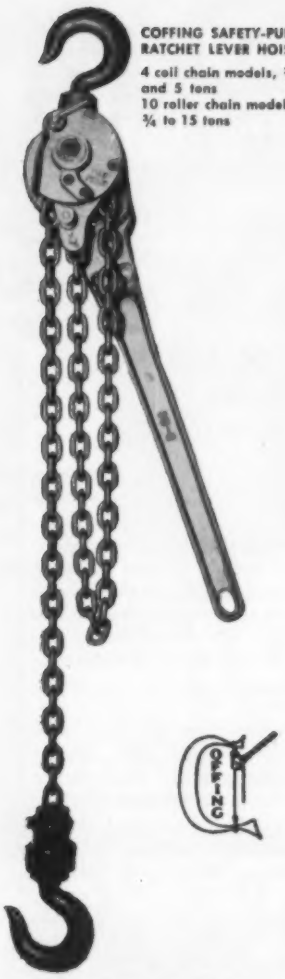
It seems very strange that such cable, without ground wire, should have been so designated for experience has shown that, although this cable can be properly used in barns and similar locations with porcelain boxes, the use of such fittings is neither practical nor safe.

From information received it would appear that thousands of feet of this cable (barn wire) as well as many more thousands of feet of ordinary so-called "loom" wire, without ground wires, have been used with metal boxes during the past few years.

Recently a new plastic cable, Type UF, has been placed on the market. This cable is made in sizes 14-2, 12-2,

IN ALL KINDS OF CONSTRUCTION AND MAINTENANCE

you play it SAFE



COFFING SAFETY-PULL RATCHET LEVER HOISTS
4 coil chain models, ¾ and 5 tons
10 roller chain models, ¾ to 15 tons

. . . with Safety-Pulls

Just as important as the time- and labor-saving advantages of Coffing Safety-Pull Ratchet Lever Hoists is the way each one protects your equipment from damage . . . your men from injury. Here's why:

Load cannot slip even if handle is accidentally released — because of dual Ratchet and Pawl principle, developed by Coffing and an outstanding Coffing advantage for over a quarter of a century.

Load is held positively at all times — there is no friction brake to slip or freeze.

Hooks will not break or straighten out.

"Safety-valve" handle will bend before any other part of hoist gives way.

Safety-Pulls are single-chain tested at 100 percent above warranted, rated capacity.

Find out more about how Coffing Safety-Pulls provide extra protection on the job. Write for Bulletin EC2SP.

COFFING HOIST COMPANY
ORIGINATORS OF RATCHET LEVER HOISTS
DANVILLE, ILLINOIS

Quik-Lift Electric Hoists • Hoist-Alls • Mighty-Midget Pullers • Spur-Geared Hoists
Differential Chain Hoists • Load Binders • I-Beam Trolleys

10-2, 14-3, 12-3, 10-3, all sizes either with or without ground wires.

With this new cable available, safe and proper wiring installations can be made with the same in barns and similar damp locations.

Your advice on the above will be appreciated.—C.E.P.

A. Section 2557 permits a NMS cable to be used with or without a grounding conductor. In other words, to ground the metal boxes etc., installed on this cable system the grounding conductor may be a part of the cable or it may be a separate grounding conductor.

This "Barn" wire is what is now known in the Code as Type NMC and is recognized for the first time as such in the 1953 Code (see Article 336). Experience has shown that the installation of non-metallic sheathed cable with boxes of non-conductive materials (porcelain, bakelite, etc.) in barns would result in the safest type of installation (see fineprint note to Section 3705).

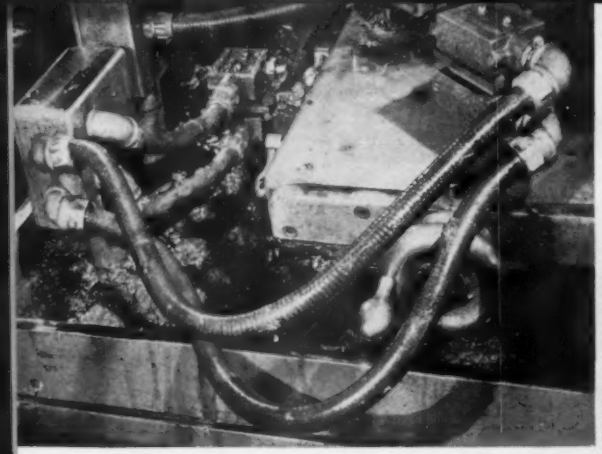
In spite of proper grounding of metal boxes, etc., in these barn installations, the mortality rate for cattle and other livestock was mounting every year. Ground lines would corrode or break off and cattle would be electrocuted in alarmingly increasing numbers. The complete isolation offered by the NMS cable installation with no metallic boxes, etc., has cut this rate tremendously.

Copies of the minutes of the various IAEL section meeting of about 1935-47 will have many interesting talks and discussions of this problem. The inspection authorities of Wisconsin and Michigan have had a great deal of experience with this cable.

The new type UF comes in two general styles. One is a type UF for use only as outlined in Section 3102b and Article 339. A second type shows not only the UF stamped on the outer covering but also has "NMC" stamped on this covering showing that it may also be used as an NMS cable in accordance with Article 336.—B.Z.S.

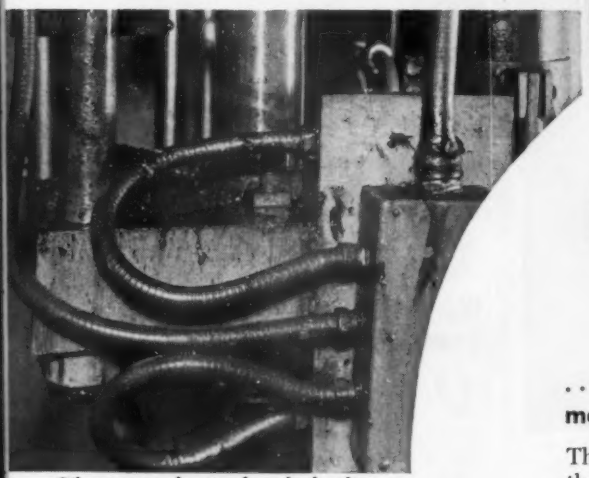
Service Drop

Q. *A new building which will be erected in this city will be approximately 1,000 feet long and 200 feet wide. Present plans call for the building to be served from both ends from two different distribution lines with substations to be located on the roof of the building approximately 100 feet distant from each end. Each substation will serve approximately one-half the plant but the plan calls for a primary voltage tie between the two*



Production grinder moves back and forth, continuously flexing Sealtite and spewing metal dust, oil and coolant over it.

Sealtite resists oil, chlorine, caustic soda and wet pulp protecting leads to motor in paper mill.



Oil, grease and water from hydraulic press can't hurt wiring protected by Sealtite. Type E.F., used here, is extra flexible to make small-diameter U-bends, hug machine tool contours.

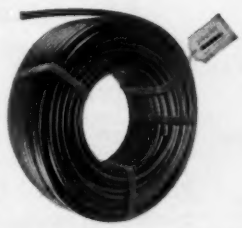
TYPE U.A. Sealtite flexible, liquid-tight conduit. Tough polyvinyl jacket over interlocked, zinc-plated steel strip. Copper conductor wound spirally in the space between each convolution on the inside of the conduit.

Give SEALTITE the dirtiest jobs around the plant

. . . this liquid-tight, flexible conduit protects wiring against moisture . . . oil . . . chemicals . . . weather . . . mechanical damage.

There are good reasons why you see Sealtite* protecting wiring on these dirty, critical jobs. It won't corrode. Nothing gets through its tough, extruded polyvinyl outer jacket. And day in, day out, Sealtite stands up under continuous flexing . . . gives maximum protection wherever wiring must connect moving parts . . . absorb vibration . . . follow contours . . . house wires with maximum protection. More, you save the installation time it takes to bend and fit rigid conduit.

TYPE U.A. is approved by Underwriters' Laboratories for service in wet spots. Copper conductor wound spirally inside conduit for positive ground.



TYPE E.F.† is extra flexible. Ideal for machine tool applications. Meets J.I.C. standards. Now available in machine tool standard light gray at no extra cost from mill stocks.

55160

*Trade mark

†Patent Applied For

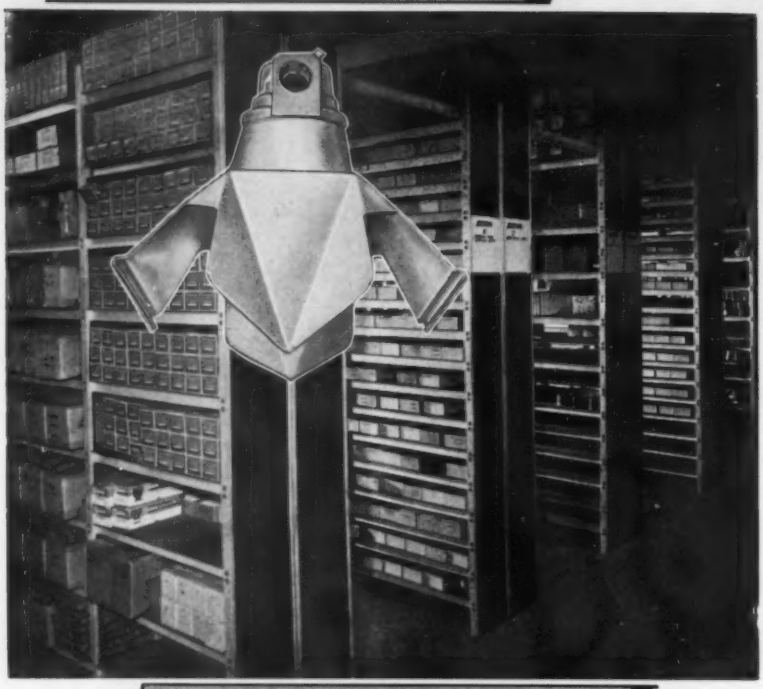
SEALTITE

FLEXIBLE, LIQUID-TIGHT CONDUIT

ELECTRICAL WHOLESALERS stock both types in easy-to-handle coils. Buy it in long, random lengths; cut it on the job without waste. Electrical Wholesalers also stock liquid-tight connectors. For complete information write for Sealtite bulletins. Address *The American Brass Company, American Metal Hose Branch, Waterbury 20, Conn.*

an **ANACONDA**® product

When You Sell
QUAD LIGHTING
You Sell Customer Satisfaction



QUAD
Aisle-Stock
REFLECTORS

for correct lighting of shelving, bins, or similar requirements

This specialized type of lighting unit has gained wide favor because of its effectiveness. It can be a source of profitable sales for you.

There's a wide spread of light downward and outward to each side of the aisle due to the scientific arrangement of the reflecting surfaces. This QUAD design also assures lighting for the upper tiers of shelving. An eye shielding feature results because of a lower light cut-off angle at each end of the reflector.

QUADRANGLE MFG. CO.
32 S. PEORIA ST. CHICAGO 7, ILL.

substations so that in an emergency current from either primary distribution can supply both subs. In your estimation would I be criticized if I O.K. this installation?—M.L.L.

A. Section 2321, paragraph d., states that by special permission more than a single service drop may be run to a building if the extra drop or drops are considered necessary due to the area over which the single building extends. The Code does not define a large area building. However, it is my personal opinion that a building the size you describe certainly can be considered a large area. Furthermore, I believe the use of two services from two different primary lines with a tie between the two substations is excellent engineering if either service drop is capable of supplying the capacity for the two subs. As buildings of this area often contain automatic sprinkler systems and fire pumps, it is also possible you may find permission under paragraph a. of this section to use a second service.—G.R.

Wire Pulling Compounds

Q. *Is graphite or a solution of wool soap dissolved in water permissible for a wire pulling lubricant?—C.J.*

A. Section 3013 of the Code recognizes the use of graphite, talc or an approved compound as a lubricant in inserting conductors in raceways. At the present time Underwriters' Laboratories list five different manufacturers of wire pulling compounds which are practically free from uncombined alkali, fatty acids and mineral oil, all of which have a deleterious effect on conductor coverings. While I am not familiar with the chemical composition of wool soap dissolved in water, it appears that it involves the use of a fatty oil found on sheep's wool and other ingredients. In accordance with the last sentence of Section 3013, such a cleaning agent could be accepted, as approved, by the authority enforcing the Code provided it had no deleterious (harmful) effect on conductor coverings.

In view of the number of compounds which are recognized or approved by U.L. it appears to me that the inspector would be justified on insisting that such compounds be used. I do not believe that he should assume the responsibility for deciding a question involving chemical analysis when such investigations have been covered by U.L.—B.A.McD.

IDEAL ELECTRICIANS TOOLS

THE TOOLS *Electricians* ask for!

IDEAL

WIRE LUBE

Takes the Hard Work Out of Wire Pulling

- *DOES THE JOB FASTER AND EASIER*
- *PROTECTS INSULATION AGAINST BREAKS AND STRAINS*
- *WORKS EQUALLY WELL ON RUBBER, LEAD OR PLASTIC COVERED WIRE OR CABLE*

Wire Lube takes the hard work out of wire pulling, even through long runs of conduit.

Easily applied by hand or brush when wire or cable is pulled into the conduit, Wire Lube provides a smooth, lubricated "ride" and minimizes the straining or breaking of insulation. It dries quickly and shrinks to a fine powder that makes later removal or addition of wire to the same conduit easy.

Wire Lube is non-corrosive, non-combustible and completely harmless to hands and clothing. Use it on any rubber, lead or plastic covered wire or cable. Not for use on asbestos-covered wire.

You can get Wire Lube in 1-quart and 1 to 5-gallon containers.

IDEAL HAS—everything you need to do wiring jobs easier . . . at lower cost

SOLD THROUGH AMERICA'S LEADING DISTRIBUTORS

These IDEAL TOOLS are REAL WORK SAVERS

IDEAL VOLTAGE TESTER

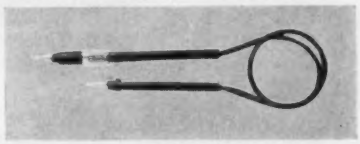
Super Safe — Double Protection — Can't Fail to Detect Voltage

Has both a solenoid, calibrated indicator and a neon test lamp — each independent of the other. No chance of failure to detect voltage. New, handy center mount for the prod keeps indicator and test lamp always in line of vision. Tests 110 to 550 volts AC—110 to 600 volts DC.

IDEAL FISH TAPES, REELS AND PULLERS

Saves up to 50% in Fishing Time

The safe, easier way to handle long conduit runs. Reel gives BIG pulling power, keeps tape always under control, protects hands. Five sizes, 50 to 200 foot lengths.



IDEAL INDUSTRIAL "TEST-GLO"

Safe, Easy-to-Use Test Light for Electrical Circuits, Sparkplugs, Motors, Fuses, Etc.

Highest quality resistors between test-prod and lead reduce voltage reaching the leads to harmless level. Safety rings prevent accidental contact with prods. Long handles. Enclosed neon test lamp always in line of vision. Glows on 80 to 600 V. AC or DC. Leads are 24" long.

IDEAL ELECTRICIANS TAPES

Friction, Rubber and Plastic — 3 Quality Tapes to Handle All Your Insulating Needs

In all popular sizes, conveniently packaged, all IDEAL Tapes meet or exceed established standards for insulating strength and permanence.

See Your IDEAL DISTRIBUTOR — or mail coupon for catalog on the complete line.

IDEAL

IDEAL INDUSTRIES, Inc.
SYCAMORE, ILLINOIS
Canadian Distributor: Irving Smith, Ltd., Montreal

IDEAL INDUSTRIES, Inc.
1041 Park Avenue, Sycamore, Illinois IDEAL

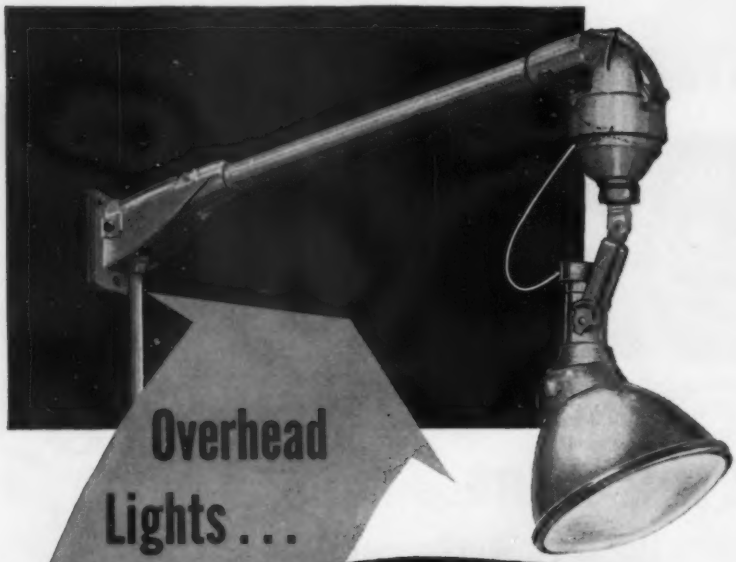
Please send us your catalog on the complete line of IDEAL Electricians Tools.

NAME_____

COMPANY_____

ADDRESS_____

CITY_____ ZONE____ STATE_____



Overhead Lights . . .

Servisafe
BRACKET UNITS
FOR WALL AND WOOD POLE MOUNTINGS

. . . serviced from the ground

NOW . . . luminaires mounted on walls and wood poles can be serviced in minimum time with complete safety. "Servisafe" Units feature a disconnecting and lowering mechanism that permits workmen to lower the lights for servicing and to reposition them quickly and easily. All operations are accomplished from the ground. All climbing and electrical hazards are eliminated.

Supplied in ready-to-install packages*, "Servisafe" Bracket Units have an unlimited range of application. They permit all-weather accessibility to luminaires . . . mounting heights up to 60 feet above ground level . . . fast, efficient, low cost maintenance.

Designed for new installations and the rapid conversion of existing facilities, "Servisafe" Bracket Units can be used with all standard pendant and flood type lighting fixtures.

* *Luminaires are not included in Bracket Unit packages.*

FOR ADDITIONAL INFORMATION, WRITE FOR BULLETIN WPH-54.

6811-TE

THE THOMPSON ELECTRIC CO.
1157 POWER AVENUE • CLEVELAND 14, OHIO

Grounded Systems

Q. *1—I recently ran across a grain elevator job which was wired for 480 volts, 3-phase, with 1-phase wire used as a solid neutral, without any overcurrent devices. Is this an NEC approved system? If so, why isn't it used more commonly? It seems as though it would be more economical, since only two overcurrent devices are required for each branch circuit. Would it be necessary to ground the neutral of such a system?—M.B.C.*

Q. *2—The code states that alternating current systems supplying interior wiring shall be grounded if they can be so grounded that the maximum voltage to ground does not exceed 150 volts and recommends that alternating current systems be grounded where the voltage does not exceed 300 volts. I would like to know if it is advisable to ground one leg of a 480-volt, 3-phase, 3-wire, delta power service to buildings which are fed from transformers connected delta—delta fed from a 4160-volt, 3-phase, 3-wire ungrounded primary. I also would like to know if surge arresters installed on the 480-volt service conductors would accomplish the same result as grounding this system.—L.E.P.*

A. Section 2514 has three general requirements or conditions for grounding ac systems:

1. Systems which will not have more than 150 volts to ground shall be grounded,
2. Systems which will not exceed 300 volts to ground are recommended to be grounded.
3. Systems which operate at higher voltages may be grounded.

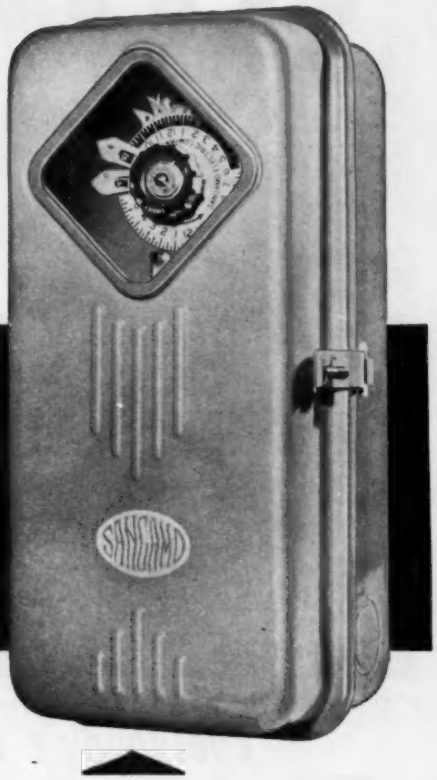
So the scope of your question is more or less covered in this third section of this Code rule.

There has been considerable controversy about this question of grounding the higher voltage systems. From a basic theoretical standpoint we may ground any system of any voltage. All we are doing is definitely setting the overall voltage level of the system with respect to ground.

The general arguments for using the ground are the same as those used in support of the use of grounding the lower voltage systems, i.e., a definite ground level voltage; any trouble on the system such as a "grounding" out of equipment or of one of the ungrounded phase lines will become immediately evident; etc.

Some, however, feel that the completely isolated system is better at these higher voltages. A person accidentally coming in contact with the

INSTALL SANGAMO TIME SWITCHES!



If you're like most busy contractors these days, you just haven't got time to make service calls on time switch installations. Besides, call backs are a nuisance and *they cost you money.*

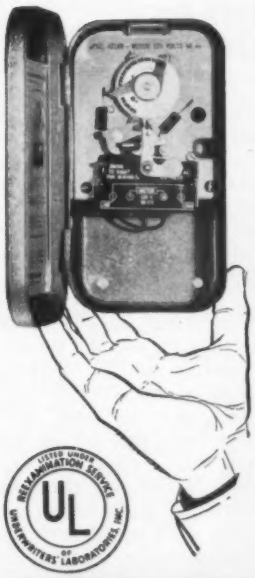
That's why we recommend the . . .

SANGAMO HEAVY DUTY TIME SWITCH

For installations that require more than a single-pole, single-throw switch, the Sangamo Heavy Duty Time Switch is your answer.

The Heavy Duty is available with an *Automatic Carryover* which assures continued operation for up to 10 hours in the event of a power failure . . . an *Omitting Device* which can be set to omit operations for one or more 24-hour periods.

Or, you can order the Heavy Duty with an *Astronomic Dial* which automatically controls the switching schedule in accordance with sunrise and sunset.



. . . don't forget the

SANGAMO TYPE B TIME SWITCH

Here's a low-priced yet rugged single-pole, single-throw time switch that also will end your service call headaches. It's designed for quick, easy installation.

Your electrical wholesaler can furnish you with all types of dependable Sangamo Time Switches. Insist on Sangamo—for the best in time switch performance.

ST55-2

SANGAMO ELECTRIC COMPANY

SPRINGFIELD, ILLINOIS

WADSWORTH
PRODUCTS!
BUILT TO SERVE YOUR CUSTOMERS BETTER

Sold Exclusively through Electrical Wholesalers

ADEQUATE WIRING SERVES AND SAVES

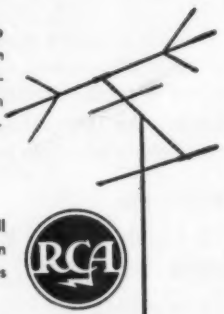
WRITE FOR FREE CATALOG

The WADSWORTH ELECTRIC MFG CO. INC.
Covington, Kentucky

Everybody's happier with
MASTER-TENNA* by RCA!

YOUR CUSTOMERS
avoid the unsightly cluster of TV antennas atop their property. One MASTER-TENNA serves an entire building. Tenants are assured of the clearest, sharpest picture from any VHF or UHF station —in black and white or color! And property owners gain an added source of revenue.

YOU
can recommend MASTER-TENNA by RCA with full confidence that your customers are receiving an antenna system developed by the most famous name in electronics.



RCA

perfect for VHF, UHF and color!

RCA Service Company branches everywhere are prepared to handle your MASTER-TENNA system estimates, equipment needs, and to provide complete MASTER-TENNA system installation and maintenance.

*MASTER-TENNA®

——MAIL COUPON TODAY FOR FULL INFORMATION!——

Master-Tenna Sales
RCA Service Company, Inc.
Camden, New Jersey

Please send full details on the MASTER-TENNA system by RCA.

NAME_____

ADDRESS_____

CITY_____ STATE_____

live conductors, or any non-current-carrying parts of the system may or may not receive a shock depending upon the line leakage or upon the extent of the system isolation.

In general there does seem to be a definite swing towards "grounding a corner" of these 440, 550 and higher voltage systems. Where this is done the interior wiring should be treated as outlined in the Code for grounding in Article 250.

In answer to the last question in L.E.P.'s letter I would say NO. The surge arrester would operate, generally, when some extraneous voltage is applied to the line (i.e., lightning, load switching, etc.). The grounding conductor acts to keep the entire system at a definite potential with respect to ground and may or may not serve with the surge protection system. Furthermore, the grounding of the system will offer protection to the system from accidental grounds, shorts and similar system breakdowns.

A complete discussion of this problem is beyond the scope of these Code discussions. However complete treatment of the subject will be found in such books as the General Electric Co "Industrial Power Systems Data Book" and the Westinghouse Electric Corp. "Electrical Transmission and Distribution Reference Book", to mention but two books which cover the subject quite thoroughly.—B.Z.S.

Reflectors On Pendants

Q. *An old pendant lighting installation used two-conductor cotton covered cord on which 12-in. reflectors were hung 3-5 ft. from the ceiling. Does the Code require more rigid support than this for the reflector? The light bulbs are changed with a pole and are constantly shorting out at the top of the reflector.—C.J.*

A. Section 4003 of the Code recognizes the use of a flexible cord as a pendant and Table 31 of Chapter 10 lists several types of cords which may be used as pendants. It is noticeable, however, that all of the cotton covered cords are not approved for hard usage. In fact only the reinforced or heavy duty cords are so approved. Section 4009 covers requirements for the connection of cords to devices and fittings so that tension will not be transmitted to such terminal connections, and Section 4171 recognizes the use of lamp shades. Several other rules in Article 410 touch on the subject, but I am unable to find any definite Code commitment with respect

to the support of the reflector and to what extent a cord might be used for this purpose. Since the installation in question is old, several factors may contribute to the cord failures at the top of the reflector. I would list them as follows: old cords in poor condition; cord insulation deteriorated by exposure to heat of lamp; method of replacing lamps; weight of reflector and method of support; cord not approved for hard usage.

In view of the hazardous conditions which now exist, I believe the entire installation should be subjected to a thorough inspection which I believe would result in a recommendation that the present materials be replaced or a new lighting method be installed. When faults occur, such as you describe, we have a warning which if discounted or ignored may eventually result in a destructive fire. Up to the present time such a fire has been avoided in spite of the odds which greatly favor one. A continuation of such a gamble will eventually result in fire.—B.A.McD.

Grounded Conductor

Q. *Is it necessary to run the grounded conductor to a small gasoline pump house in which the management wants no lights but only wants service to operate a 3-phase motor driving the pump?—E.P.W.*

A. Yes. Section 5026 of the National Electrical Code under paragraph e. states: "Wiring in a Class I location, when supplied from a grounded alternating current supply system in which no grounded conductor is a part of the service, shall be provided with a metallic connection between the supply system ground and the raceway system at the service entrance. The metallic connection shall have a current carrying capacity not less than 1/5 that of the service conductors, and shall in no case be smaller than No. 10 if of soft copper, or No. 12 if of medium or hard-drawn copper."

Then under paragraph f. of this same section you will note that where it is neccessary to abandon one or more grounding connections to avoid objectionable passage of current over the grounding conductors, the connection required in paragraph d. and e. of this section shall not be abandoned while any other grounding connection remains connected to the supply system.

Therefore it is necessary when wiring a gasoline bulk plant to extend the neutral to the pump building even though no lights are required in that building.—G.R.

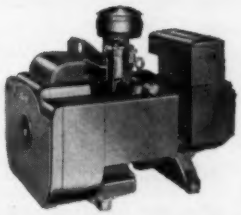
When storms knock out electric power...

an ONAN Emergency Electric Plant supplies essential electricity! Prevents property damage: protects lives

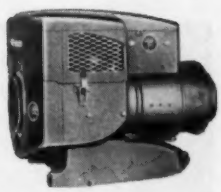
Danger to life and property, loss of business and customer goodwill, all can be prevented with Onan Standby Electric Power. When electricity is interrupted for any reason, an Onan Standby Plant will take over the power load supplying 60-cycle "highline" current for lights, motor-driven machines, electronic devices and other equipment.

Onan Electric Plants are built to run continuously . . . for as long as the emergency exists. Require little space for installation, run smoothly and quietly. All Onan units can be equipped with automatic controls.

Onan gasoline-powered emergency electric plants are available in sizes from 1,000 to 100,000 watts A.C. . . . fill any need for standby power.



MODEL 5CW 5,000 watts A.C.



MODEL 30SCK 3,500 watts A.C.

Write for FREE estimate!

If you will let us know your requirements we will recommend the size and type plant you need.

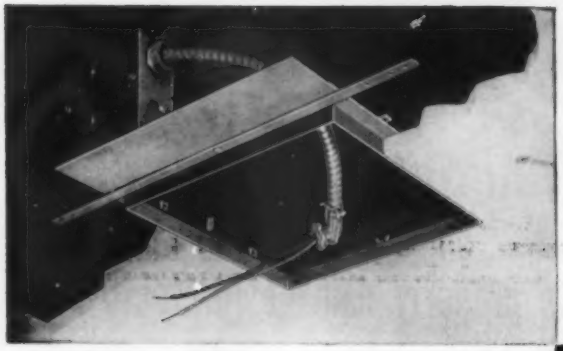
D. W. ONAN & SONS INC.
2817 University Avenue S. E.
Minneapolis 14, Minnesota

Onan ELECTRIC PLANTS

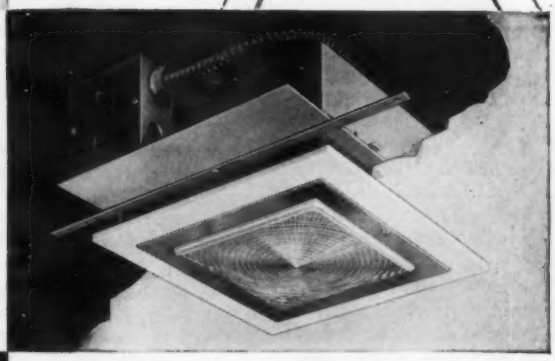
1,000 to 100,000 watts

ART METAL

makes your wiring EASIER *and* FASTER



The Binary Plaster Frame of Art Metal units has complete installation equipment including attached junction box, wire, Greenfield and two mounting rails.



Complete specifications on Art Metal pre-wired plaster frame and lens boxes are found in Bulletin 254. We suggest you write for this bulletin . . . it'll show you how to save installation time and money on your next job!

Art Metal recessed lens box housings are easily installed as the job nears completion. Vertical slotted mounting holes provide adjustment for ceiling thickness from ½" to 2".

THE **ART METAL** COMPANY

CLEVELAND 3, OHIO

Modern Lighting

Colonial-Period Church Combines 19 Lighting Mediums

The J. M. Wallace Memorial United Presbyterian Church of Pittsburgh, Pa., has a recently completed edifice. This new structure is designed along simple Colonial lines and is relatively modest in size. Yet it contains an excellent lighting system, an up-to-the-minute wiring plan, emergency illumination with an automatic transfer switch, dimmer controls for several lighting arrangements, numerous electric motor and heating applications, plus provisions for the future addition of clock and program, public address, signal and Executone systems. All of these features contribute greatly to the beauty, efficiency and usefulness of the structure, and all of them were contributed by the Frame Electric Company—the owner of which also served as chairman of the Church's building committee.

INCANDESCENT coves, surface-mounted fixtures, recessed downlights and adjustable spots lend variety to illumination plan adopted by this Presbyterian Church in Pittsburgh, Pa. Intensities may be adjusted by dimmers to keep light levels in conformity with the mood of the various services. Electrical work was performed by the Frame Electric Company.

RECREATION and religious education room is lighted to average foot-candle level of 30 by means of large, square, shallow, incandescent units surface-mounted between structural beams on the concrete-slab ceiling. Partitions can be extended out from walls along beam lines to form separate alcoves for classes when desired.

To provide this Church with a comprehensive lighting plan, a total of 19 different types of fixtures were combined, using fluorescent, standard incandescent and aluminized-reflector lamps in a variety of luminaires created by Manning, Curtis, Century, Herwig, Fullerton, Kirlin, Solar, Westinghouse, Wheeler, Crouse Hinds and Pittsburgh Reflector. By combining this liberal selection of fixtures it was possible to create an overall lighting plan with a high order of flexibility, simplicity, utility and appearance, yet strictly in keeping with the Early-American period design that distinguishes the building as a whole.

For example, the studied unpretensiousness of the chancel and sanctuary owes much of its charm to a central vaulted arch which is evenly cove-lighted by 100-watt incandescent lamps mounted along either side on 12-inch centers in SL sockets. In addition, ecclesiastical type surface-mounted units are positioned above and in front of each window, with Colonial gold finish and ivory glassware enclosing assemblies of three 60-watt lamps. These fixtures, and the coves as well, are dimmer-controlled so that illumination can be raised or lowered in accordance with the nature of the service being held at the time.

To highlight the chancel and altar, PAR-38 floodlights are recessed in the arched ceiling above them, while 150-watt reflector-spots, contained in bullet-shaped luminaires, are used to highlight the pulpit and lecturn. Directly beneath the sanctuary is a large utility room which may be partitioned to form separate alcoves for Christian education or may be cleared for athletics, games, general meetings or similar social functions. Illumination in this room is provided by shallow (6-inch deep), square (4 by 4 feet) glass-dished fixtures housing six 40-watt incandescent lamps each, arranged so that one luminaire is contained in each alcove when partitions are extended, yet symmetrically balanced for uniform general lighting when the area is being used as a single

SAVE Man-hours,

have correct 3-phase connections with the

KNOPP PHASE SEQUENCE INDICATOR

Push the button and see the Sequence 60–600 V.

No adjustments required for readings

You just clip on the Knopp Phase Sequence Indicator, push the safety button and you are sure whether the phase sequence is A-B-C or C-B-A.

This new model K-3 Knopp Phase Sequence Indicator, like the previous models, shows phase sequence by direction of disc rotation rather than by lamps. Gives correct indication regardless of voltage or circuit conditions without changing taps or dials. It protects equipment and assures properly connected polyphase wiring; all voltages between 60 and 600, 3 phase, 3 wire, 25-60 cycles. May be used on frequencies up to 400 cycles on the higher voltages.

Light Weight, Compact, Small

It stands up under rough field use and gives accurate and reliable service. It is made by Electrical Facilities Inc., technical electric equipment manufacturers of 26 years' experience. This indicator has a laminated bakelite housing and no exposed metal parts. It is built for complete safety. Fully insulated clips can remain attached between tests as safety push button permits indication only when needed. Weighing but 21 oz., the Knopp Phase Sequence Indicator is small and easy to carry. Price $29.25; leather carrying case, $5.85 additional. Order this improved Model K-3 today or write for complete description.

KNOPP Voltage Tester

For easier, safer, faster testing use the Knopp Voltage Tester. Gives magnitude of voltage between 110 and 600; a-c or d-c, pure or rectified; 25 or 60 cycles. See your dealer or write for illustrated free, descriptive Bulletin No. 425.

KNOPP

Electrical Facilities Inc.

4232 Holden St. Oakland 8, Calif.

room. Due to the concrete-slab construction of the building, it was not possible to utilize recessed fixtures in this instance, yet by placing them between the deep structural beams it was possible to obtain considerable shielding, thereby delivering ample (30-fc) illumination to the floor while minimizing brightness from many light sources simultaneously.

In other rooms of the church, such as the minister's study, adult classrooms, kitchen and utility areas, lighting is fittingly utilitarian or ornamental, employing a wide range of ecclesiastical type fixtures, downlights, troffers, vaporproof units and emergency light outlets.

Aside from the lighting installation, other electrical equipment includes electric heating elements in kitchen steam tables, wall-recessed radiant units, hot water heaters, condensate and circulating pumps, exhaust fans, a motorized organ blower and apparatus for sound reproduction.

Relighting Enhances Study Hall

A 500% boost in the lighting level was obtained without increasing the load in a study hall of the College of St. Elizabeth at Convent Station, N. J. The installation of 20 2-lamp 96-in semi-indirect slimline units affords a uniform intensity of 25 footcandles and creates a feeling of comfort and spaciousness in the room that has increased its use from 900 up to 2000 hours annually.

The original equipment which consisted of 21 200-watt inverted bowl, Brascolite type fixtures delivered only 4 to 6 footcandles. The attractive wood-paneled ceiling was lost in a haze of gloom and the general dinginess of the room made it unpopular with students and faculty alike.

Despite a limited budget, contractor Edward J. White determined to design an installation that would enhance the basic architectural beauty of the hall as well as improve the level of illumination.

Each of the existing fixtures was suspended from the center of one of the rectangular decorative panels that form the basic motif of the ceiling's design. To highlight this ornamental pattern, White centered a semi-indirect slimline unit below each panel. In addition to the esthetic effect, the indirect component of light enlarges the appearance of the room by brightening the ceiling and also reduces the brightness ratio of the fixtures because of the 85% reflection factor of the eggshell white ceiling.

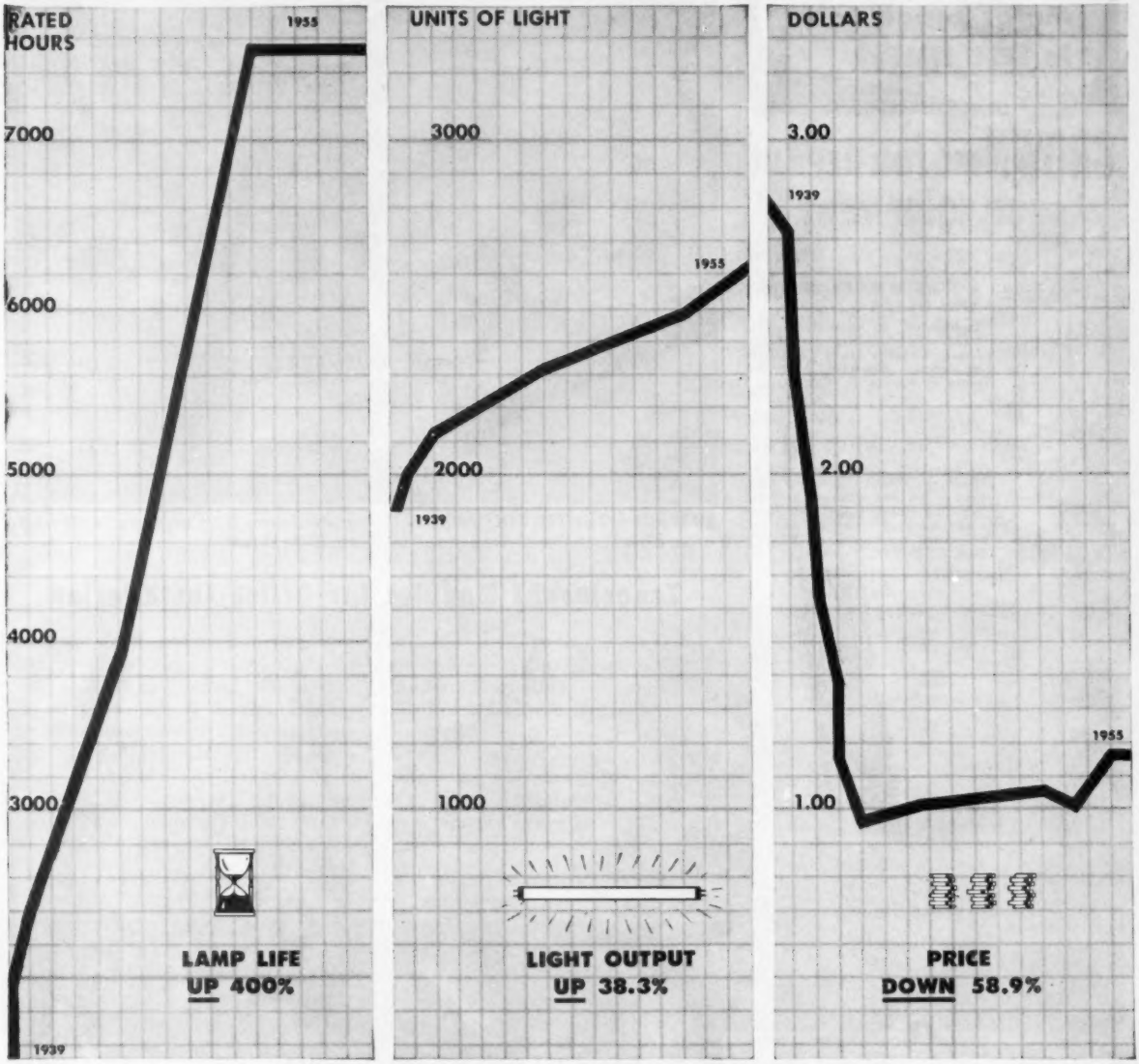
With this layout it was possible to avoid the necessity of relocating outlets by installing an extra stem at the center of each fixture. Since the new units are rated at 190 watts—less than the original 200-watt incandescents—the contractor was able to use the existing circuitry.

To further minimize glare, White selected Sylvania Trimline series fixtures which feature eggcrate louvers that provide 45-degree longitudinal shielding. Instant-start 96-in T-12 slimline lamps were employed to obtain optimum efficiency and long life.

Mr. White, who heads the Newark, N. J. firm of the same name, believes this job demonstrates how one good lighting job promotes another. The visual comfort and the attractive appearance the room obtained through this installation have made the school officials light conscious. As a result, several new projects are already under way with more to come.

SEMI-INDIRECT SLIMLINES bring out the architectural beauty of this small study hall. Upward component brightens ceiling to create feeling of spaciousness and reduce brightness ratio. Use of room has doubled since relighting.

YOU EXPECT THE BEST VALUE FROM G-E FLUORESCENT LAMPS



16 times more value for your fluorescent lamp dollar than in 1939

Today you don't have to pay more than $1.15 for the finest fluorescent lamp made: General Electric. Sixteen years ago it would have cost you $2.80 or $1.65 more. And while price has been going down, we've been pushing quality up. General Electric has upped light output 38%, increased lamp life 400%.

In terms of what you really judge lamps by, a General Electric 40-watt fluorescent lamp that lists at $1.15 today is a *16-times bigger value than it was in 1939.*

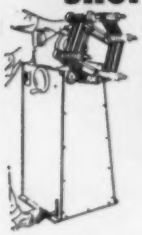
For further information, contact your G-E lamp supplier or write to Lamp Division, General Electric, Department 166-EC-2, Cleveland 12, Ohio.

Progress Is Our Most Important Product

GENERAL ELECTRIC

Turn Out Better Motor Repair Jobs in LESS TIME

CROWN MOTOR REPAIR SHOP EQUIPMENT



• COIL WINDER DRIVES AND HEADS . . .
Engineered in every detail to make coil winding easier and faster. Rugged, heavy duty drive is smooth, powerful, built for years of service.

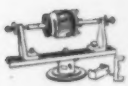
"Universal" (illustrated on Coil Winder Drive), "Midget" and special 3-Phase (shown at left) Winding Heads handle practically every kind and size of coil encountered in repair work. WRITE FOR CATALOG.

• GROWLERS
Meter shows coil shorts instantly. "INTERNAL" type for use on stators 6" and up and armatures and rotors 6" to 14".

CAT. NO. 2520

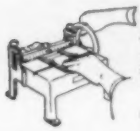
"EXTERNAL" type for finding grounds, shorts and open circuits in armatures 2" to 8" in diameter.

CAT. NO. 2501



• ARMATURE AND STATOR HOLDER
Positions work for easier, quicker repairing. Rotates on ball bearing in *two* directions.

CAT. NO. 2105



• INSULATION FORMER
Crank out all the slot insulation needed for any job in a few minutes! Insures uniform, neat-fitting slot lining.

CAT. NO. 2301

• SUPERSENSITIVE BALANCING WAYS
For static balancing of armatures, fans and other light rotating parts. Sensitive to .006 ounce-inch. No centering needed. Complete with dust cover.

CAT. NO. 1105

SEE YOUR LOCAL DISTRIBUTOR — OR WRITE FOR CATALOG

CROWN INDUSTRIAL PRODUCTS COMPANY
719 Amsterdam Street, Woodstock, Illinois

Please send us complete catalog on Crown Motor Repair Equipment.

NAME_____

FIRM NAME_____

ADDRESS_____

CITY_____ ZONE____ STATE_____

SURFACE-MOUNTED FIXTURES on 10-foot row-to-row basis gives 65 footcandles to employees in this office lighted by Mitchell Modules.

Translucent Modules for Office Installation

Surface-mounted units are essential where the desire for high-level illumination is coupled with a ceiling of only moderate height. And good diffusion and shielding is likewise necessary if the new installation is to provide even, glare-free and shadowless lighting to the employees working below the fixtures. These were the conditions encountered by the Cleveland (Ohio) Chain and Manufacturing Company when they switched from pendent-mounted incandescent bowls to their present installation.

As indicated in the accompanying photograph, the present installation employs Mitchell Modules, mounted end-to-end, 10 feet above the floor on the acoustical tile ceiling, and 10 feet from row to row. The result is an even 65 footcandles of illumination to working surfaces of desks.

LIGHTING MAINTENANCE received widespread recognition when the National Association of Lighting Maintenance Contractors held their first conference and elected Walter Fink of Senior Fluorescent, Atlanta, Ga. (shaking hands, right), as their first president. Doing the congratulating is the new association's secretary-treasurer Luther Nunnally, Fluorescent Maintenance Co., Birmingham, Ala. Looking on with obvious approval are three NALMCO regional vice presidents who, in the usual order, are Francis Clark, Lighting Services of Waterbury, Conn. (northern); Ed Creed, C & S Lighting Maintenance Company of Cleveland, Ohio (central), and George Kort, Maurys Fluorescent and Appliance Service of Louisville, Ky. (southern). Also elected but not present when the shutterbug clicked was western vice president Herb Mendelsohn, Sun Ray Lighting Corp., Kansas City, Mo.

YOU MAKE PROFITS GROW WHEN YOU MAKE MINUTES COUNT

Just what is profit?

Simply stated, it's what you have left *after* you pay for materials AND labor.

Material costs are generally constant. It's TIME that makes the difference! And, that's one of the big differences—all in your favor—you'll find in Day-Brite fixtures. They're engineered to save your installation time—to help you make a bigger profit! That's the actual on-the-job experience of thousands of electrical contractors all over the United States.

Think of this, too: The time you save on one job enables you to move on faster to the next—where you'll again save more time when you install Day-Brite fixtures. And, of course, again make more profit! ... Remember, also, that every Day-Brite job is a job well done—it fully backs you up in building a reputation that leads to added business and added profits!

This is not just "sales talk"—you can prove it if you SEE, EXAMINE and COMPARE Day-Brite installation costs with those of other fixtures.

A FEW DAY-BRITE TIMESAVERS THAT HELP YOU MAKE DOLLARS OUT OF MINUTES

TIMESAVING ADJUSTABLE "A-J*" HANGER...Reduce installation time on hard-to-work with, uneven ceilings. Swivel fitting and 1⅛" hand-operated vertical adjustment let you lay in your fixture run, trim it up later...No field assembly of screws, bolts or locknuts is required. "A-Js" give you a quick, simple, foolproof way to save time and increase profit.

*PATENT NO. 2446736
UNDERWRITERS APPROVED. TM REG. U.S. PAT. OFF.

TIMESAVING HYDEE HANGER**... Easy, low-cost way to hang chain-suspended fixtures. Connect wires to receptacle—fits standard 4" or 3¼" outlet box or plaster ring...Screw hanger to outlet box—only two screws needed. No centering, no punching, no drilling. Screwdriver only tool needed... Hang the fixture and plug it in—that's all! ...Use Hydees—save time, increase profit!

**PATENT NO. D-141024 AND NO. 440914.
UNDERWRITERS APPROVED. TM REG. U.S. PAT. OFF.

OTHER TIMESAVING DAY-BRITE FITTINGS

Sliding Clamp Hanger Fittings...Twin-stem Hangers (8"and 24" lengths) ...Ice-Tong Hanger Clamps.

Day-Brite Lighting, Inc., 5402 Bulwer Ave., St. Louis 7, Mo....In Canada, Amalgamated Electric Corp., Ltd., Toronto 6, Ont.

SEE YOUR DAY-BRITE DISTRIBUTOR

"DECIDEDLY BETTER"
DAY-BRITE
Lighting Fixtures

5412

NATION'S LARGEST MANUFACTURER OF COMMERCIAL AND INDUSTRIAL LIGHTING EQUIPMENT

ELECTRICIANS!

Here's a new convenience in cutting pliers

It's simple but plenty effective! The *cushion* is tough, rubbery red Plastisol bonded right beside the cutting edge. As the pliers close, the *cushion* grips the short end of wire, holding it tightly.

The *"Cushion Throat"* is specially valuable in electronics work... makes cuts inside chassis without danger of wire snips falling into set. Grips spring or hard wire too—safety feature keeps wire from flying! Order from your distributor!

Only $1 list additional—applied to most UTICA diagonal or side-cutting pliers.

EXCLUSIVE UTICA PATENT

UTICA "Cushion Throat" Pliers

UTICA (when referring to hand tools) is a trade mark registered in the U. S. Patent Office.

U T CA

THE HALLMARK OF QUALITY

UTICA DROP FORGE & TOOL CORP.
UTICA 4, N. Y.

In Canada: Adlam Tool & Supply Co., Ltd., Montreal

TAXES

NEW METHODS OF RAPID TAX DEPRECIATION

A discussion of your rights under the rapid depreciation allowances of the new tax law, covering the financial assistance and economic gain which can be yours.

By Willard F. Stanley,

Corporate Services, Inc., New York, N. Y.

THE NEW Income Tax Code gives American industry the right to adopt for tax purposes, one of the new, rapid methods of depreciating new property acquired, constructed, or reconditioned on and after January 1, 1954. This right also applies to projects initiated prior to January 1, 1954 to the extent of the cost of construction on or after said date.

Basic Methods

The basic methods of tax depreciation under the new law are:

1. *THE STRAIGHT LINE METHOD.* This is the method customarily used in the past and consists of depreciating property in equal annual instalments over its anticipated life expectancy. This method applies to all depreciable property, whenever acquired or constructed and of any life expectancy.

2. *THE DECLINING BALANCE METHOD.* This method is not new, but hitherto was permitted only in special cases. The new law permits a write off of 200% of the straight line rate annually, applied to the depreciated balance remaining at the end of each year. For example, if a new property had an expected life of 5 years, the write off the first year would be 40% of cost (instead of 20% under the Straight Line Method); the next year the deduction would be 40% of the balance of 60% remaining undepreciated, or 24% of cost; the following year the 40% would apply to the 36% of cost remaining undepreciated, which would make the deduction equal to 14.4% of cost; and so on. This method may be used only with respect to new (not second hand) tangible, depreciable property acquired or constructed on and after January 1, 1954, and having a life expectancy of 3 years or more.

3. *THE SUM OF THE YEARS DIGITS METHOD.* This method, too, has been used occasionally in the past, but is now made available by the new law to all taxpayers with the same limitations as to the date of acquisition or construction and life of property as in the case of the Declining Balance Method. The formula for computing deductions under this method is to add together each year in the expected life of the property (in the case of a 4 year life, this would be 4 plus 3, plus 2, plus 1, equals 10); and then divide this figure each year into the remaining years of life expectancy (including the current year); thus for the first year the calculation would be 10 divided into 4, or 40% of cost; the next year 10 would be divided into 3, making 30% of cost, and so on.

4. *ANY OTHER METHOD* selected by the taxpayer, provided the cumulative deductions at the end of any taxable year during the first two-thirds of life expectancy of the new property shall not exceed the cumulative deductions under the Declining Balance Method. So, it is still possible to use special formulae, such as units of production, units of labor, etc., but, taxpayer must be prepared to defend these special formulae as reasonable.

The new law does not permit taxpayers without consent of the Internal Revenue Service to switch from one

method to another as to new property acquired or constructed in any year, except the right is expressly given in the law for taxpayers to change at the end of any taxable year from the Declining Balance Method to the Straight Line Method, as to the undepreciated balance (less salvage) then remaining. The Declining Balance Method if carried forward unchanged would, theoretically, never fully depreciate the property, generally leaving an undepreciated balance from 3 to 13% at the end of anticipated life, but taxpayer could deduct the unrealized salvage in the year of retirement. Full depreciation can be obtained by switching to the Straight Line Method. The best time for the switch, in order to obtain maximum overall deductions, is at the end of the year following the half-way mark in the estimated life expectancy. Taxpayers must be prepared to defend the reasonableness of the Straight Line rates at the time the change is made.

The Declining Balance Method disregards the factor of salvage and thus may be more desirable for taxpayers with properties having a high salvage factor. By switching to the Straight Line Method taxpayers would inject the element of salvage into the depreciation allowance, since salvage must be considered in fixing depreciation rates under the Straight Line and Sum of the Digit Methods. However, in all but exceptional cases, it is likely the best results will be obtained through adopting the Sum of the Digits Method or Declining Balance Method, switching to Straight Line.

What Taxpayers Are Affected?

Individuals, partnerships, corporations and all other forms of taxable entities, acquiring or constructing new, tangible, depreciable property on and after January 1, 1954 may avail themselves of any of the rapid methods permitted by the new law.

What Are the Elections?

The test as to adoption of rapid depreciation and changes in methods adopted applies to each year's acquisitions. If taxpayers fail to adopt rapid depreciation as to particular property acquired in any year, they cannot do so in any subsequent year as to that property. But taxpayers can elect rapid depreciation as to the same type of property acquired in any subsequent year. Similarly, if taxpayers elect a rapid depreciation method they cannot change in any subsequent year to any other method as to such property (except from Declining Balance to Straight Line), but they are free to

You'll do a better audio system job with
RCA SOUND EQUIPMENT

No doubt about it—both new projects and many existing buildings now offer greater opportunities for sound installations. Your efforts to secure this profitable business will get more favorable consideration if your specs read . . . "RCA equipment throughout."

If you would like further information on how to develop more sound equipment jobs, send coupon today for your free copy of *"Sound In Industry."*

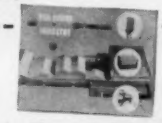
Not only is RCA known the world over as "first in sound," but your RCA Engineered Sound Distributor is best equipped in both experience and inventory to assist you in planning and supplying a sound system which will reflect credit on your good professional reputation.

SOUND PRODUCTS

RADIO CORPORATION of AMERICA

ENGINEERING PRODUCTS DIVISION, CAMDEN, N. J.

In Canada: RCA VICTOR Company Limited, Montreal



Sound Products, Dept. N-41, Building 15-1
Radio Corporation of America, Camden, N. J.

Please send me free your new RCA booklet on sound—"Sound In Industry."

NAME_____ TITLE_____

COMPANY_____

ADDRESS_____

CITY_____ ZONE_____ STATE_____

ABOLITE SLOTTED NECK REFLECTORS

keeps lamps cooler, cleaner longer

Get the most from lighting installations with ABOLITE Slotted Neck Reflectors. Slotted neck design — an original ABOLITE idea — starts automatic air circulation around the lamp and through the slots to keep dust and grime from settling. Lamp and reflector surfaces stay cleaner twice as long . . . less maintenance is required. In addition, this design provides 7% more up-light.

LONGER LAMP LIFE

Constant air circulation in ABOLITE units keeps lamp necks cooler, provides maximum lamp life. Lamp neck temperatures are reduced an average of 40°F when tested on 1000 watt reflectors.

WHITER-THAN-WHITE — FLOODS MORE LIGHT

Famous ABOLITE Titanium white porcelain enamel finish reflects all the light from the lamp — provides *highest* lighting efficiency. There's an ABOLITE Reflector for every lighting requirement . . . ask your jobber for complete details.

WHITER THAN WHITE — ABOLITE Lighting

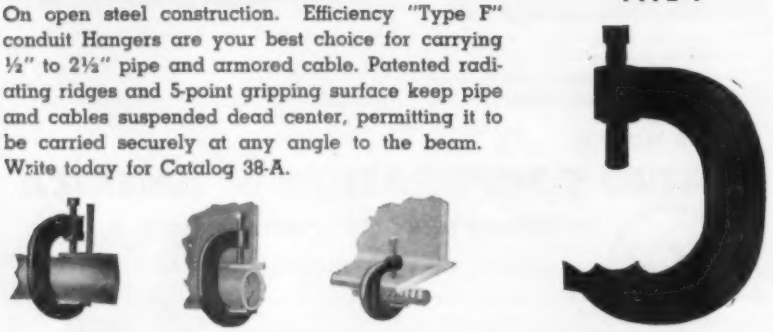
THE JONES METAL PRODUCTS CO. • West Lafayette, O.

Carry **WATER, GAS AIR LINES, CABLE** *at any angle to beams*

with

"EFFICIENCY" CONDUIT HANGER "TYPE F"

On open steel construction. Efficiency "Type F" conduit Hangers are your best choice for carrying ½" to 2½" pipe and armored cable. Patented radiating ridges and 5-point gripping surface keep pipe and cables suspended dead center, permitting it to be carried securely at any angle to the beam. Write today for Catalog 38-A.



Efficiency ELECTRIC AND MANUFACTURING CO.

MANUFACTURERS OF EFFICIENCY ELECTRICAL DEVICES FOR CONDUIT, WIRE AND CABLE SUSPENSION

EAST PALESTINE, OHIO

"EFFICIENCY" DEVICES FOR CONDUIT and CABLE SUSPENSION

TAXES (continued)

adopt a different method as to similar property acquired in any subsequent year.

Different methods may be adopted for different classes or items of property acquired in the same year, or one rapid method may be applied to all such property on a composite basis. As to each year's acquisitions, elections must be made in the tax returns for that year.

Are Depreciation Rates Affected?

The rapid methods of depreciation which the new law permits should not affect depreciation rates or life expectancy of property. These rates should be the same for the new property as to which rapid depreciation is adopted as for similar property which taxpayer owned prior to January 1, 1954. Rates could be altered, however, where there are changes in conditions, or location of property or excess of accumulated reserves, etc. But in such cases the change would no doubt have been required regardless of the adoption of rapid depreciation.

Fears have been expressed that the benefits of higher depreciation allowances under the rapid methods applied to new property might be offset by lower depreciation allowances for tax purposes with respect to older properties. The language of the statute and the expressed intentions of Congress both seem to make such fears groundless.

Financial Assistance

The primary benefit of rapid depreciation is that by increasing depreciation deductions for tax purposes in the early years of the life of the new property involved, it defers to later years the payment of substantial amounts of taxes which otherwise would be payable in such early years under the Straight Line Method. The financial assistance taxpayers will obtain by reason of the additional cash working capital available to them as a result of the deferred taxes, will be helpful in all cases where rapid depreciation is adopted, but should be of the greatest importance where the new property has a relatively short life and represents a substantial degree of expansion.

The Declining Balance Method always provides the largest tax deferral in the first two years, and is accordingly the preferable method in cases where financial assistance is of primary importance to the taxpayer. This financial assistance is the fundamental

purpose of the new provisions as stated in the Congressional Committees' reports. Without the benefit of such tax deferrals taxpayer would have to provide equal amounts either through internal funds (such as depreciation accruals or retained earnings) or by bank loans or the sale of debt or equity securities. The source of such funds will vary. Where the relation of new to old property is comparatively small, depreciation funds may be sufficient. Where the ratio of new property is large, sale of new securities or bank loans may be necessary, with accompanying financial problems and higher money costs. It is in these latter cases that rapid depreciation will be of maximum help. The financial help supplied by rapid depreciation may be of particular importance where a modernization program is being considered and availability of cash from deferred taxes may be crucial.

Economic Gains

Another, and totally different, benefit from rapid depreciation, of more universal application, since it affects all taxpayers in varying degrees, is the economic gain by reason of the free use of the deferred taxes during the period of such deferral. To compute the amount of this economic gain, two factors are necessary, first the weighted average cost (after taxes) of the money which would have been used had the tax not been deferred, and next, the net period of tax deferral. The cost of money factor will vary in each case and must be estimated by the taxpayer. This cost of money should be figured "after taxes." It is not the present cost but the assumed weighted average cost over the life of the property. This item is difficult to estimate accurately, particularly where long-lived property is involved. However, as a rough overall average, between 4½% and 5% would not seem unreasonable.

The economic gain from rapid depreciation is arrived at by multiplying the cost of the new property (as to which rapid depreciation is adopted) by the assumed average annual cost of money replaced by the deferred taxes in the early years of the life of the property (and used to pay the additional taxes in the later years of such life). The result is then multiplied by the number of years representing the weighted average period of economic gain. Applying an assumed tax rate to the result of the last computation gives the amount of economic gain.

The percentage of economic gain to the cost of the new property will in-

The following is the Operating and Selling Policy of Arro Expansion Bolt Company, manufacturers of quality fastening and drilling devices for masonry — for over twenty-five years.

DISTRIBUTION—Arro products are sold nationally through qualified Wholesale Hardware, Industrial Supply, and Electrical Supply Distributors.

INQUIRIES—All inquiries are referred to our distributors in their respective territories.

PRICES—Arro products are reasonably priced to promote their broad use by consumers. Distributor mark-up on the Arro line insures an attractive profit.

RESALE—Arro distributors are urged to respect our suggested resale prices. Every lawful method is used to encourage this fair practice of merchandising.

STOCK—Arro offers its distributors a complete line of fastening and drilling devices for masonry. Distributors are expected to maintain a sufficient stock to adequately serve their trade.

SERVICE—Ten branch warehouse stocks are maintained in key cities, strategically located throughout the nation. All orders are shipped immediately from factory or branch warehouse stocks within 48 hours.

GUARANTEE—Arro products are fully guaranteed against defects in material and workmanship. Returned goods are accepted on authority of the Marion office only.

SALES AIDS—Arro helps promote sales for distributors by supplying a variety of sales literature, displays, and catalogs; by cooperating with their salesmen; and by regularly advertising in nine leading trade journals.

PARTICIPATION—Arro is an active member of leading industrial and trade associations.

This has been our Sales Policy since our birth in 1930. We believe that this policy, possible only under the American system of free enterprise, has been an important factor in our substantial growth and friendly relations with our distributors.

TRADE ARRO MARK

ARRO EXPANSION BOLT CO.

1540 Boone Ave., MARION, OHIO

AVA

TO 5,000 VOLTS & TO 2,000,000 CM!

AVA POWER CABLE BY CONTINENTAL WIRE

has long been known as one of the *highest rated temperature* cables made . . . Today, Continental AVA also supplies the *highest current capacities* in the industry (servicing from 600 to 5,000 volts) — and in the *widest range of sizes* available (18 AWG to 2,000,000 CM inclusive) . . . Write for stock-catalog, or about your particular requirements — special wires manufactured to meet specific conditions.

HEAT- & MOISTURE-RESISTANT WIRES, CABLES & CORDS for

Air Conditioners, Airplanes, Bakeries, Bake Ovens, Ballast Transformers, Boiler Rooms, Busses, Central Stations, Clothes Dryers, Commercial Refrigerators, Cranes, Dry Kilns, Electric Furnaces, Electric Motors, Electric Ranges, Electronic Equipment, Hair Dryers, Heat Controls, Heating Elements, Infra-red Heat, Lighting Fixtures, Locomotives, Mercury Switches, Motion Picture Machines, Oil Burners, Panel Boards, Paper Mills, Power Houses, Pyrometers, Radios, Range Lights, Range Timers, Resistance Soldering, Restaurant Equipment, Rheostats, Sewing Machines, Show Case Lights, Smokehouses, Soldering Irons, Spotlights, Stage Lights, Steel Mills, Switchboards, Table Stoves, Television Sets, Thermostats, Toasters, Waffle Irons, Water Heaters, *et cetera ad infinitum.*

CONTINENTAL
WIRE CORPORATION
Plants at YORK, Pa.,
& WALLINGFORD, Conn.
SALES: Box 363, Wallingford, Conn.
Phone 9-7718 DEPT. M C

bells... from the smallest to the largest

The finest bells are engineered and manufactured by SIGNAL. Indoor and outdoor types are available in sizes from the new 2½" midget a-c contactless vibrating bell to the large 20" model—[2½", 3", 4", 6", 8", 10", 20"]. Write for Catalog 5A-3

originators of the underdome bell

SOLD THROUGH ELECTRICAL WHOLESALERS

Wheelock SIGNALS
SIGNAL
ENGINEERING & MFG. CO.
LONG BRANCH NEW JERSEY

TAXES (continued)

crease in relation to the length of the life expectancy of the property. If the life expectancy is about 7 years or more, the Sum of the Digits Method will produce a higher economic gain than the Declining Balance Method.

What Are Objections?

The following are the principal objections to the adoption of rapid depreciation:

1. The fear of lower depreciation rates being applied to older properties has already been dismissed.

2. The adoption of rapid methods will require keeping two sets of property records for tax purposes. Each year's additions should be segregated. In some cases it may not be practicable to apply rapid depreciation to small property items because of the clerical work involved. Where the amounts of new property are reasonably large in dollars, however, the benefits should far outweigh the trouble and expense.

3. It is sometimes argued the annual rate of tax depreciation is not too important, since the taxpayer can write off only 100% of cost and any acceleration merely "defers" and does not "save" taxes. This view overlooks the substantial benefits inherent in the financial assistance and/or economic gains from the free use of the deferred taxes, and is, therefore, unworthy of serious consideration.

4. Most important of all probable objections is, perhaps, the fear that higher tax rates in later years, when depreciation deductions will be lower if a rapid method is used, will more than offset the benefits.

While possibility of loss through higher tax rates deserves serious consideration, fear that such higher rates are likely to offset the economic gains (based on average after tax money costs) seems unfounded.

5. Higher future money costs in years of lower depreciation, when the deferred taxes are to be paid, constitute another possible danger. Like the bugaboo of higher future tax rates, fear of loss through higher money costs appears generally unwarranted.

It is not feasible to present here detailed discussion of many important aspects of this subject or to include many formulae, tables and charts pertaining thereto. These will be contained in a new book by the author, entitled "New Rapid Tax Depreciation —What It Means to You" (of which this article is a condensation), which will shortly be published by Prentice-Hall, Inc.

ADV.

How An Electrician Makes His Volt-Ammeter Pay

An electrical contractor in Elmont, N. Y., has found that a pocket-size, split core, a-c ammeter not only saves him considerable time, money and work, but also, by enabling him to make accurate on-the-job estimates, helped him convince customers of the need for additional wiring and installation.

Here are a few examples of how his Amprobe volt-ammeter helps make jobs pay off:

In a furniture plant in Brooklyn, he was called upon to check the electrical load while the plant was going full blast. It was a 3-phase, 4-wire, 200 amp service fed with 4/0 wire. Measuring each phase, he found the current to be A-115 amp, B-128 amp and C-160 amp. With the customer watching these measurements—and visibly impressed that operations continued uninterrupted—it was no problem to sell him on the idea of balancing the phases and make it possible to add some new equipment.

Another case involved repeated blowing of fuses on the circuit running a motor on a centrifugal dryer. This was 1-½ hp, 1750 rpm 220 v. 60 cy single phase motor fed by #12 line with a 30 amp fuse which was connected to a #8, 60 amp line. Checking one of the conductors of the motor, he found that it drew 48 amp on starting, sustaining a current in excess of 30 amp for 3 seconds and drew 9 amp once it came up to rated speed. Showing the customer that there was nothing wrong with the motor, but that he should change the #12 line and 30 amp fuse block to a #8 Rh wire and protect it with a 45 amp fuse, the job was sold with a nice profit.

In a third call, to a doctor's office where a fuse blew every time the sterilzer was turned on, he checked the current with the sterilizer disconnected. His Amprobe showed 15.3 amp load. Checking the premises uncovered the difficulty—a ¾ ton air conditioner had been plugged into the same circuit. It was no trouble convincing the doctor that a separate line was needed for the air conditioner, and another wiring job was sold.

These examples are but a few of the many thousands of ways an Amprobe will pay off for electrical contractors. For more detailed information, write Pyramid Instrument Corporation, 630 Merrick Rd., Lynbrook, N. Y.

WHY

settle for an ordinary voltage tester?

Ask yourself these questions	The AMPROBE Junior	ordinary voltage tester
Does it measure current as well as voltage?	YES	NO
Does it give you full visibility on a graduated reading scale?	YES	NO
Does it fit conveniently in your pocket?	YES	YES
Does it measure within ±3% accuracy?	YES	NO
Does it come in a full line of models to meet different problems?	YES	NO
Does it protect you against shorts and shocks?	YES	YES
Does it balance loads, locate grounds, determine motor overloads, check rating of circuit breakers?	YES	NO

***The Amprobe Jr.* gives you so much more! And the cost is only $19.85 (just a few dollars more than an ordinary voltage tester).**

Why be half-equipped with just a voltage tester? The **Amprobe Jr.** meets *all* your testing needs... measures voltage and current instantly and accurately without shutting down equipment. All this with one rugged and inexpensive pocket-size tool!

There's an **Amprobe** model for every job, every budget: from 10 amp and 250 volts to 1200 amp and 600 volts AC; from $19.85 to $67.50. See them at your jobber's today.

Send for valuable **Amprobe** literature showing how you can do a better job in less time. Mail coupon now to: PYRAMID INSTRUMENT CORP., LYNBROOK, N. Y. (Export Div.: 458 Broadway, N. Y. 14), world's largest manufacturer of snap-around volt-ammeters.

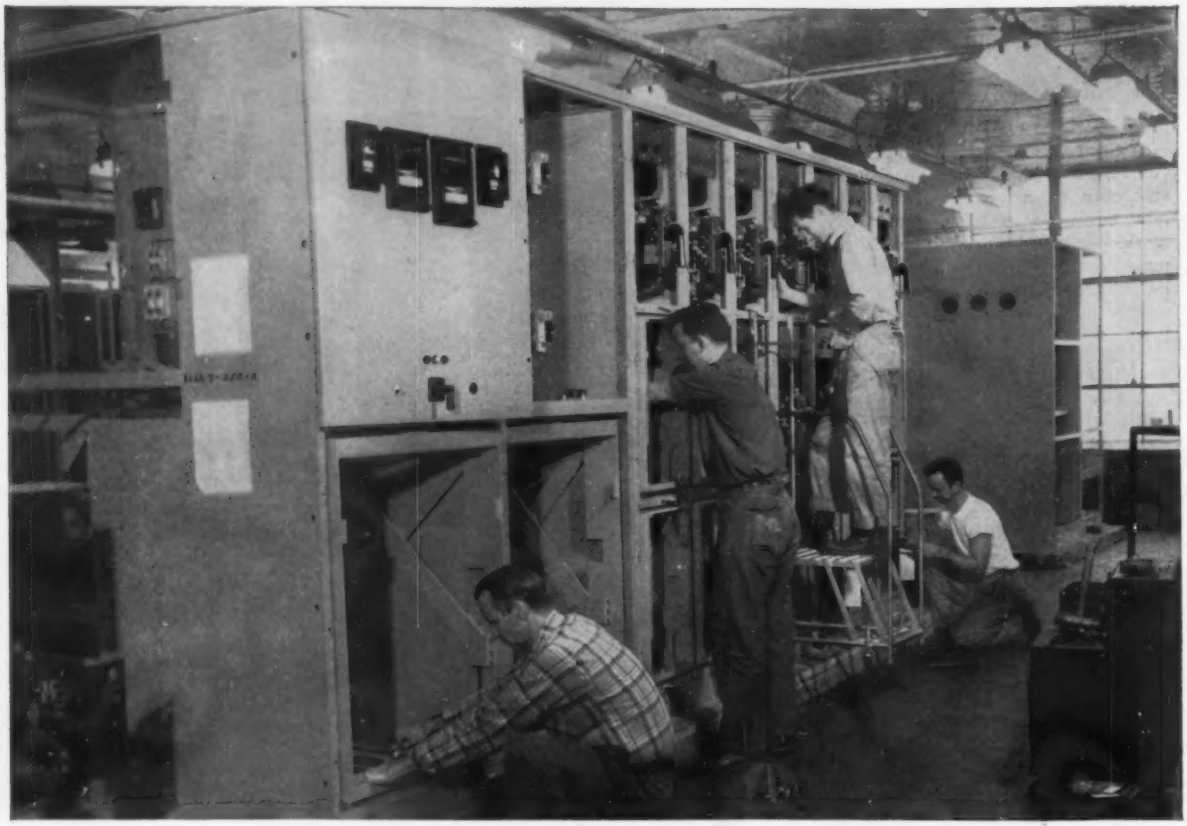
Amprobe Jr.®
snap-around volt-amp tester **$19.85**

Send For Free Service Bulletin

Pyramid Instrument Corp.
Dept. ECM-25, Lynbrook, N. Y.
Please send me the Amprobe service bulletins checked below:

- ☐ How to cut costs and land more jobs
- ☐ Trouble-shooting electric motors
- ☐ How to boost service profits
- ☐ Electrical servicing of hermetic units

NAME_____
COMPANY_____
ADDRESS_____
CITY_____ ZONE____ STATE_____



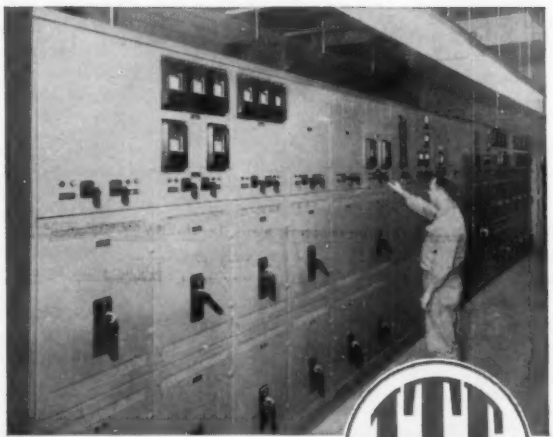
ASSEMBLY—In process of assembly is this standard low voltage switchgear unit.

A sound investment—standardize on I-T-E Low Voltage Switchgear

Before you specify low voltage switchgear, check the advantages offered by I-T-E. It is the finest of modern switchgear—factory assembled; shipped as a unit; ready to install; providing the maximum in dependability, safety, reduced maintenance costs, and attractive appearance.

I-T-E Circuit Breakers are the heart of the gear. Their performance in providing maximum protection has been proved conclusively in thousands of installations. I-T-E Structures are designed specifically to house and interconnect these time-tested protective devices and auxiliary equipment. When you combine the two, you get the finest of circuit breakers in the finest of structures—with much less special engineering, much faster delivery, and units tailor-made in standard frames to fit your requirements.

Standard I-T-E Low Voltage Switchgear Assemblies are available with ratings through 6000 amp continuous and 100,000 amp interrupting, 600 v a-c and 250 v d-c. For details, contact the I-T-E field office nearest you. Look in your classified directory under Electric Equipment, or write for Bulletin 6004A. I-T-E Circuit Breaker Company, Switchgear Division, 19th and Hamilton Sts., Philadelphia 30, Pa.



INSTALLED—A standard I-T-E low voltage switchgear unit in operation.

I-T-E CIRCUIT BREAKER COMPANY, Switchgear Division

In The News

Share-Cost Home Rewiring Plan Launched in Chicago

A new residential rewiring program launched by the Commonwealth Edison Company in Chicago is seen as a substantial business builder for electrical contractors and contractor-dealers. It will also open the way to more electrical service capacity for some 615,000 dwelling units (one, two and three-family type), in Chicago and northern Illinois, now served by obsolete, inadequate, 2-wire, 110-volt services. Prime objective of the plan is to encourage sale and use of 240-volt, single-phase appliances by offering a share-cost proposition to customers on the company's lines; also financing of the customer's portion of the installation cost.

Under the program, authorized through filing with the Illinois Commerce Commission and effective Jan. 1, 1955, the Edison Company will bear the cost of service entrance wiring for eligible customers. This covers wiring from the service drop connection on the home down through the meter cabinet to the terminals of the customer's main disconnect panel. The customer must agree to pay for installation of a 100-amp capacity, 120/240-volt service disconnect and distribution panel plus the 240-volt circuit to either a range, clothes dryer, air conditioner, built-in auxiliary heater or water heater. In general, installation will be made by an electrical contractor.

To benefit from this plan, the customer must meet the following eligibility requirements:

1. The dwelling must now be served by a 2-wire, 110-volt, overhead ac service from company lines.

2. The customer must propose to install, at his expense, a disconnecting means and distribution panel of company authorized specifications for each residential occupancy.

3. The customer must propose to install and connect, at his expense, a circuit from this panel to a 240-volt, single-phase appliance.

In buildings where one or more of the occupancies are already supplied with 120/240-volt service, if all eligibility requirements are met, the customer must agree to pay for that portion of the service entrance wiring expense normally borne by the company under this plan. In that case, the company, by agreement with the customer, will arrange for and finance the wiring installation.

ALLEN D. FISCHBACH with his father Harry, welcoming former Luftwaffe Capt. Otto Bohlen and his wife, Hilde, when they arrived from Germany on the liner America recently. During World War II Mr. Bohlen saved the life of Lt. Fischbach and three other American flyers. Last July Allen enlisted the aid of Chancellor Konrad Adenauer to help him locate Bohlen, and the result was an appeal over Radio Free Europe and a response from Mr. Bohlen. Bohlen and his wife are visiting the U. S. on a two months' trip as the guests of Harry Fischbach, of Fischbach & Moore, Inc. Allen is Los Angeles representative of F&M.

In the case of an eligible building with underground service, the company will pay the amount normally borne for overhead service entrance. The customer must pay the difference.

The program does not apply to any non-residential portion of a building, nor to customers supplied with three-phase or direct current service.

Standard Specifications

A *standard* installation, based on company specifications, must meet the following conditions:

1. Electric service supplied by a service drop directly from a company-owned pole to the wall of the building.

2. Meter connection cabinet, whether outdoor or indoor, and disconnecting means and distribution panel, are located on either a first floor or basement wall.

3. The new distribution panel and point of connection to existing distribution panel are both located in same first floor room or basement.

4. Total length of service entrance run, including any horizontal portion, to disconnecting means does not exceed 30 feet.

Service entrance wiring will consist of one of the following combinations of materials, as approved by local authorities, in the order of preference listed:

(a) Service entrance cable, Type SE, with bare neutral.

(b) Insulated conductors in electric metallic tubing.

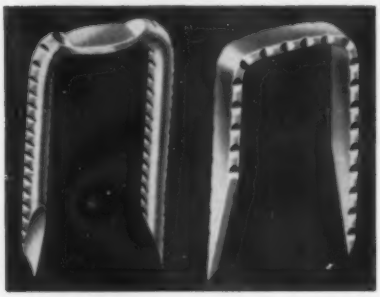
(c) Insulated conductors in rigid conduit.

Conductors must be of the following AWG sizes, or equivalent current carrying capacity, with Type RHW insulated copper wire:

Number of Residential Occupancies in Building	Service Head to Meter Cabinet	Meter Cabinet to Disconnect Means
One	2—No. 4 (85 amp)	2—No. 4
	1—No. 6 (65 amp)	1—No. 6
Two	2—No. 2 (115 amp)	2—No. 4
	1—No. 4	1—No. 6
Three	2—No. 2	2—No. 4
	1—No. 4	1—No. 6

The standard installation provides a minimum size entrance panel consisting of two 60-amp capacity, parallel-connected, fused pull-outs plus four 15-amp, 110-volt plug fuse units. If the customer desires, of if the contractor can sell-up the job, panels with more plug fuse and 240-volt pull-out circuits can be installed. The Edison Company will finance, up to $100 per occupancy, the customer's expense for wiring in addition to the amounts covered by the plan and listed in a Residential Wiring Price List. A standard price for service and range circuit might be $87.00. The utility pays about $35.00 for the service wiring; the customer, $52.00. The price list, issued to interested appliance dealers and contractors, contains *fixed* prices for service entrance wiring, approved main disconnecting

AMAZING *New* CABLE STAPLES



provide up to 67% greater holding power . . . keep cable installations in place and in safe condition

● **HOLD-TITES REALLY HOLD TIGHT:** New Titchener "Hold-Tite" Cable Staples have barbed edges—to grip the wood and hold firmly. Laboratory tensile tests prove up to 67% greater holding power over same size ordinary staples.

● **HOLD-TITE STAPLES KEEP CABLES IN PLACE:** Ordinary cable staples often drop out or pull out a few days after they're put in. Sagging cables can be dangerous. Use *Hold-Tites*—make sure your flexible cable installations, metallic and non-metallic—stay up where they belong.

● **WILL NOT BEND:** Hold-Tite Staples are made of special analysis steel which doesn't bend or deform—even when hammered into hardest woods. Sharp, even points start straight, go in easily.

● **A COMPLETE LINE:** Available in six sizes. Four in flat wire (⅞", 1", 1⅛", 1⅜" inside length), two in round wire, E-Z Drive type (1", 1¼" inside length).

Send now for *free* box of Hold-Tite Staples!

E. H. TITCHENER & CO.
72 Clinton St., Binghamton, N. Y.

means and distribution panel installations and special appliance circuits. These prices, listed for individual communities and their surrounding unincorporated areas, carry a flat price for each appliance circuit to be installed to any desired location on any floor of the building. For those communities where local code requirements exceed the company's authorized specifications for service entrance wiring, the price list shows that portion of the cost of service entrance wiring to be borne by the customer.

All prices listed were compiled on the basis of competitive bids by interested electrical contractors in the localities served by the Edison system. In all cases, the Edison Company will bill the customer for his portion of the wiring expense either on a 30-day charge or installment account which may be a 6- or 12-month term. Installment accounts will include the same carrying charges as for a Company merchandise sale. Coupon payment books will be issued to the customer buying his wiring on time. In each case, the electrical contractor is paid in full for his installation and does not have to arrange or carry the financing. Program promotion and customer contacts are handled by the utility.

A reported 100 electrical contractors throughout the Edison territory are in the plan at this time and reliable contractor-dealers are being invited to investigate the business possibilities—provided they can meet the installation prices listed in the price book. Edison personnel see a 1955 potential of some $19,625,000 in 240-volt appliance sales in the Chicago and Northern Illinois area. Broken down it looks like this: 30,000 electric ranges; 15,000 electric clothes dryers; 40,000 air conditioners and 15,000 electric water heaters.

At present, this residential rewiring program is limited to the calendar year 1955. If experience during this test period is favorable, the Commonwealth Edison Company plans to continue, and perhaps enlarge, the program in subsequent years. This will be subject to approval of the Illinois Commerce Commission.

N.Y.C. Electrical Contractors Raise Pension Payments

Electrical contractors in the New York City area added $20.00 per month to payments under the pension plan covering 8,000 members of IBEW Local 3 in a new agreement announced

***WHEN 10 SECONDS CAN MEAN* MONEY**

See Page 147

ACCURATE

Measure Speed by Touch with "STANDCO"

VIBRATING REED TACHOMETERS

PORTABLE & STATIONARY TYPES

Ideal for totally enclosed electrical equipment

• SIMPLE • EFFECTIVE • DURABLE
• SAFE • IMPOSE NO LOAD
• EASY TO USE • EASY TO INSTALL

Various Models

Ranges as low as 600 RPM, as high as 100,000 RPM.

Write for Bulletin No. 770-A

HERMAN H. STICHT CO., INC.
27 PARK PLACE NEW YORK 7, N. Y.

Ask for **IDEAL**

CRIMP CONNECTORS

with the

"Wrap-Cap"*

THE UNIQUE DIAPER-WRAP

INSULATOR

STRONGER . . .
BETTER INSULATED . . .
EASIER TO USE!

- Provides a Perfect Pre-Fabricated Insulating Job Every Time
- Insulates All Around Joint and Between Wires
- Puncture-Proof — Gives Double-Thick Protection Over Wire Ends
- Insures Complete Safety — Deep Skirt Completely Covers the Bare Conductor, Even When Wires are Not Stripped Evenly

Both Sleeve and "Wrap-Cap" Insulator Listed by Underwriters Laboratories, Inc., for General use (600 V.) in Branch Circuit and Fixture Wiring.

NO EXTRA CRIMPING TOOL TO CARRY

IDEAL All-Purpose
ELECTRICIANS PLIERS
(Patent Pending)

For use with IDEAL Crimp Connectors and *all around* electrical use. Crimping die makes double indentation in sleeve, increases sleeve's gripping action. New England nose gets into hard-to-reach places, twists wires, burrs conduit. Special plastic covering on handles for more comfortable grip.

*** Patented, No. RE 23649 and other patents pending**

Only 2 Parts . . .

THE SLEEVE
Patent Pending
Cadmium-plated steel sleeve makes vibration-proof, non-crystallizing, low-resistance joint, with greater holding power.

and "Wrap-Cap"
Made of same long lasting vinyl material as used on TW wire. The first insulator to insulate around and between wires. Far easier to use than tape.

PERFECT CONNECTIONS IN 3 QUICK STEPS

1. Crimp sleeve with IDEAL Electricians pliers. Clip off excess wire.
2. Push "Wrap-Cap" down over sleeve.
3. Pull tabbed cap between wires and over end of joint.

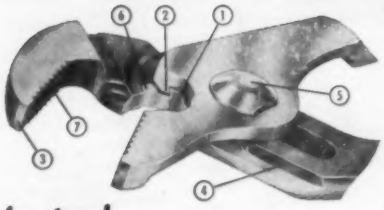
SOLD THROUGH AMERICA'S LEADING DISTRIBUTORS
In Canada: Irving Smith, Ltd., Montreal

Send coupon for catalog data

IDEAL INDUSTRIES, Inc. IDEAL
1041 Park Avenue, Sycamore, Illinois

Please send catalog data on the new IDEAL Crimp Connector, "Wrap-Cap" Insulator and Electricians Pliers.

NAME_____
COMPANY_____
ADDRESS_____
CITY_____ ZONE____ STATE_____



here's why

1. Interlocking principle prevents slipping under any load. **2.** New type wide base lugs cannot shear. **3.** New nose design for gripping small objects. **4.** Patented design of tension edge eliminates stress concentration at channels. **5.** Interlocking design minimizes stress on joint bolt. **6.** Precision machined interlocking surfaces result in perfect fit, distributing pressure evenly. **7.** "Rite Angle" teeth guarantee maximum bite and minimum wear.

Look for the Channellock line when you're shopping for hand tools. Channellock pliers offer features that you can't get with other makes. And when you buy a Channellock plier, ask to see the full line—you'll find a style and model to do any job better.

THE PLIER DESIGN THAT OBSOLETES ALL OTHERS

CHAMPION DeARMENT TOOL CO. • MEADVILLE, PA.

on January 12. Under the new agreement the union's retired members will receive $190.00 per month of combined industry and Social Security payments.

The pension fund and plan are administered by a Joint Industry Board made up of employers and representatives of Local 3 and have been favorably viewed by civic and state leaders as exemplary of the highest standards of joint union-managements pension administration.

New York State Industrial Commissioner, Dr. Isador Lubin, hailed the pension and health fund in the New York City electrical construction industry as proof that such funds can be administered "more efficiently and better than a bank or insurance company under government regulations."

Time Payment Key to Home Electrical Modernization

If America's old house wiring is ever to catch up with the rapid multiplication of home appliances and high lighting levels demanded by today's electrically-operated existence, it will probably have to be accomplished through time payment buying of expanded wiring systems.

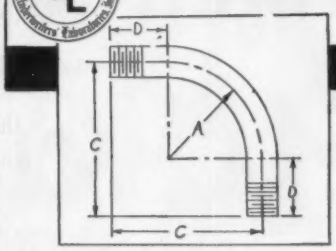
This prediction by L. E. Barrett, plan committee chairman, National Adequate Wiring Bureau, New York, was coupled with an announcement of the 11th Annual Wiring Conference to

INVESTIGATE OVERLOADED circuits in schools is the advice given to custodians and progressive school boards by Lee F. Farney, electrical engineer, Electrical Contractors, Inc., Chicago. Farney discussed lack of circuit capacity at Grant Community High School, Fox Lake, Ill., before panel workshop on new co-ordinated classroom just opened at the school. New room features flush fluorescent lighting and ceiling and unit ventilator electric glass radiant heating panels.

conduit of columbus

SIZES OF SPECIAL

LARGE RADIUS 90° ELBOW



radius "A" in inches	offset "C"	straight end "D"	length unbent	pipe sizes
12"	1'9"	9"	3'0"	1"-2½" inc.
15"	2'0"	9"	3'6"	1"-3" inc.
18"	2'4"	10"	4'0"	1"-3½" inc.
24"	2'11"	11"	4'11"	1"-4" inc.
30"	3'5"	11"	5'9"	1"-5" inc.
36"	3'11"	11"	6'6"	1"-6" inc.
42"	4'6"	12"	7'6"	1"-6" inc.
48"	6'0"	12"	8'4"	1"-6" inc.

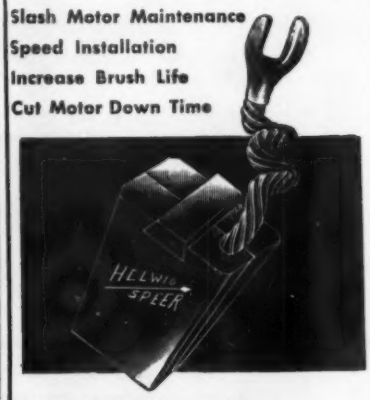
Also available 45°, 30° and 60°. All are U.L. approved.

CONDUIT PIPE PRODUCTS CO.,

Conduit by COLUMBUS COLUMBUS, OHIO

SOLD ONLY THROUGH WHOLESALERS

Slash Motor Maintenance
Speed Installation
Increase Brush Life
Cut Motor Down Time



MULTIFLEX brushes with NEOPRENE pads

. . . really protect your motor and generator investments. Engineered for better contact and reduced vibrations, Helwig Multiflex brushes eliminate uneven wear and reduce circulating current. Get multiple brush operation without expensive changes. The key to longer commutator life is a quality brush designed to FIT, instead of a cut-down, so-called standard brush. Save production time and money with Helwig tailor-made brushes. Write for details on the Helwig brush inventory control plan.

HELWIG CO. CARBON PRODUCTS
2502 N. 30th Street
Milwaukee, Wisconsin

most modern office building

Rising dramatically from the heart of Pittsburgh's Golden Triangle, the Alcoa Building is the product of many months of painstaking research and field testing. To the last detail, it was planned as the world's most functional office building.

With such heavy emphasis on function and long-term economy, Heinemann Circuit Breakers were the logical choice for protection of the Alcoa Building's electrical branch circuits. Approximately 3500 Heinemann General Purpose Circuit Breakers are installed.

Modern circuit protection for the needs of today... and tomorrow

Most rugged of all panelboard circuit breakers, the HEINEMANN General Purpose Model combines a workhorse design with precision performance.

...protected by HEINEMANN CIRCUIT BREAKERS

Heinemann Circuit Breakers are hydraulic-magnetic. This principle provides the fastest short circuit interruption available for maximum safety. At the same time, it always permits you to use the full safe rated capacity of the circuits. There's no "false alarm" tripping. Thus, with the same wiring you have, in effect, greater usable electrical capacity ... for use now or in the future to meet growing electrical requirements.

GET THE FACTS FOR YOURSELF. Write for your free copy of Manual 101, "What You Should Know About Circuit Breakers."

HEINEMANN ELECTRIC COMPANY
132 PLUM STREET • TRENTON 2, NEW JERSEY

HEINEMANN *Circuit breakers*

The REVERE Catalog is filled with Lighting Equipment that will enable you to select and install the right units for each job. You benefit by buying from one source—one responsibility—get matched units—ease of obtaining replacements and easier wiring and maintenance. Write us today!

Local representatives will give you all the help you need.

REVERE ELECTRIC MANUFACTURING CO.

6017 BROADWAY CHICAGO 40, ILL.

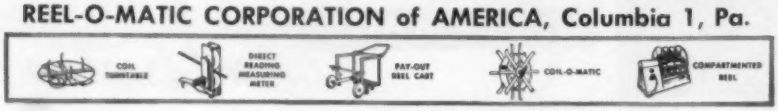
Available in Canada thru Curtis Lighting, Ltd. Leaside, Ontario

REEL-O-MATIC SAVES TIME AND LABOR IN HANDLING CABLE, WIRE ROPE, MESSENGER STRAND

You'll find the new REEL-O-MATIC quickly pays for itself . . . saving you money because it actually does the work of four men! In a matter of minutes, one man can measure, coil and cut an order to specification . . . saving time, handling and labor! REEL-O-MATIC does a better job faster.

In addition to a complete line of standard models, such as Model "A" shown above, special REEL-O-MATICS are constantly being developed to suit specific needs . . . the REEL-O-MATIC principle has been successfully adapted to meet many unusual requirements of the United States Government and private industry. To ease your cable and wire handling problems, investigate REEL-O-MATIC today! *Write for free catalog* describing the complete REEL-O-MATIC line of cable and wire rope handling equipment . . . ask for engineering advice on special problems.

REEL-O-MATIC CORPORATION of AMERICA, Columbia 1, Pa.



be held February 24-25 in Chicago at the La Salle Hotel.

Mr. Barrett said that credit buying is so much a part of the American economic life that even where customer cash is readily available, the offer of installment credit is a strong incentive to a home owner who hesitates to buy both a new major appliance and a needed wiring job.

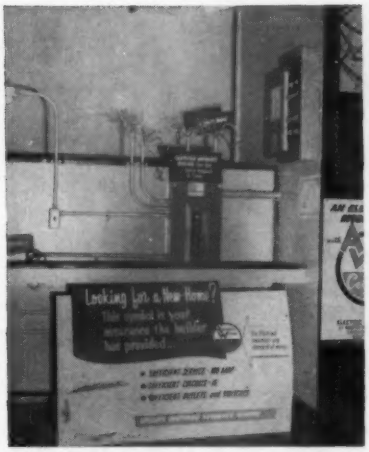
A workshop on the first day of the 1955 Wiring Conference will deal with this problem as it has been handled by utility companies which since 1953 have entered the field of financing rewiring for their customers, who repay on their monthly electric bills; or by utilities which have chosen other financing methods. Approximately 16 such companies have now announced wiring modernization campaigns in connection with financing arrangements.

Chicago Banks Use Better Wiring Exhibits

Financial institutions in Chicago are displaying a healthy interest in the home wiring modernization market. They are making available to home owners either straight financing of rewiring costs or inclusion of rewiring in open-end mortgages. To encourage customers and the public to come in and discuss wiring costs with bank home planning personnel, a number of such institutions have used special wiring display panels constructed by the Electric Association of Chicago.

The Chicago Federal Savings and Loan Association, at Chicago's busy State and Washington St. corner, set aside their entire lower lobby for a 3-week display of the wiring panels. The exhibit (1) called attention to the hazards and inconvenience of POW (poor, overworked wiring); (2) depicted seven improvements offered in a wiring modernization "package" recommended by the Electric Association's Home Wiring Modernization Committee; and (3) featured Certified Adequate Wiring advantages in new homes.

Following a successful "run" at Chicago Federal, the display was moved to the Lincoln National Bank on Chicago's north side for a similar period, then to the south side at the District Savings and Loan Association headquarters. In each case, bank personnel offered assistance in arranging financing of home wiring modernization work and referred inquiries to neighborhood electrical contractors requesting such leads. In addition, contractors were invited to send qualified personnel to the exhibits to offer ex-



ELECTRICAL ADEQUACY offered by 100-ampere service and distribution facilities is the story told by this last of four display panels customers pass before reaching bank's home planning department and clinic.

planation, answer questions and distribute their sales literature.

Another wiring tie-in activity was the home planning clinic conducted by the First Federal Savings and Loan Association, also in Chicago's Loop area. Here, at full-house sessions, Roger Kellogg, Electric Association wiring specialists, outlined detailed requirements of modern home wiring to provide electrical living convenience.

The wiring displays are available to other financial institutions in the area as part of the Electric Association's continuing promotion of home wiring modernization and residential electrical adequacy.

Conference on Electrical Utilization of Aluminum

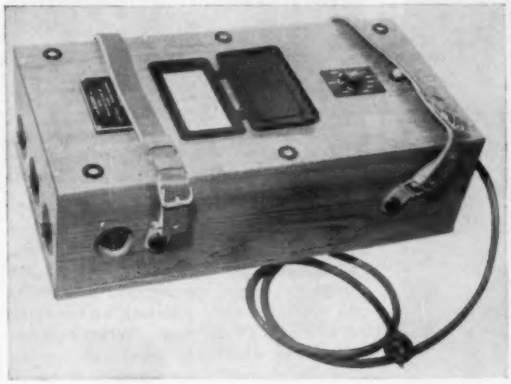
The first national conference on the electrical utilization of aluminum, jointly sponsored by the Power Division and Pittsburgh Section of the AIEE, is scheduled for March 15-17 in Pittsburgh's William Penn Hotel. During this period, papers and discussions will consider the use of aluminum in conductors and cables, plus its use as mechanical and structural components of electric systems and equipment, covering the field of application from residential appliances to industrial apparatus, transformers, rotating machinery, switchgear and bus conductors.

More than 60 speakers will appear on the program, representing all branches of the electrical industry and analyzing such problems as the use of aluminum for welded substation bus, high voltage applications, high-tension

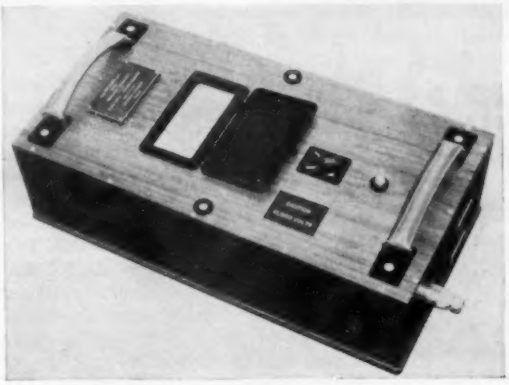
NEW PRODUCTS

RECTIFIER OPERATED, HIGH-RANGE MEGGER® INSULATION TESTERS

Triple and Single Voltage Models



Triple-Voltage
5000, 2500 and
1000 Volts d-c
Up to
100,000 Megohms



Single-Voltage
10,000 Volts d-c
Up to
200,000 Megohms

The high ranges now available in "Megger" Insulation Testers are extremely useful in several kinds of field tests. In the case of bushings, the insulation resistance of new units should be in the order of 50,000 megohms, and any deterioration that may occur in service, which can be detected at 2500 volts d-c, will be quickly observed with a "Megger" Instrument, of that range and voltage. The high-range "Megger" Instrument in ranges up to 200,000 megohms and ratings up to 10 kv, therefore, gives the maintenance engineer a simple and relatively inexpensive tool for detecting the deterioration in bushings in its early stages.

Generators, transformers and cables can have relatively high 1-minute insulation resistance values which may increase with time during a time-resistance test. In such cases—and they are frequent—the instrument range should be high enough to permit observation of this increase of resistance with time.

These are only a few of the many applications for these instruments. For complete information on all hand-, motor-, or rectifier-operated, high-range Megger Testers request **Bulletin 21-20- ECM.**

JAMES G. BIDDLE CO. B-434-R
1316 Arch St., Philadelphia 7, Pa.
Please mail me ☐ Bulletin 21-20-ECM. Thank you.

Name _____

Job _____

Company _____

Address _____

JAMES G. BIDDLE CO., 1316 ARCH ST.
PHILADELPHIA 7, PA.
ELECTRICAL TESTING • SPEED MEASURING INSTRUMENTS • LABORATORY & SCIENTIFIC EQUIPMENT

- COST
- CAPACITY
- SPACE

COST!

Save up to 25%. With the wide range of Furnas Electric starters to choose from, you don't have to waste money on starters too big for the job.

CAPACITY!

The many in-between sizes in the Furnas Electric line allow you to choose the control that is best suited for your particular job.

SPACE!

You can save up to 40%. By selecting the exact size starter for your requirements you get a starter that is more compact.

Write today for free 140-page Catalog 101. Furnas Electric Company, 1067 McKee Street, Batavia, Illinois.

FURNAS ELECTRIC COMPANY
BATAVIA, ILLINOIS
Sales Representatives in all Principal Cities

IN BUSINESS since 1929, Jim Scarborough operates under the firm name of J. & J. Electric Service in Ocala, Fla., and does electrical construction work for phosphate mines, veneer and saw mills, and other industries, as well as for commercial jobs of all types. When not devoting his efforts to electrical service work, he's usually out fishing, which is his No. 1 outside activity.

switch construction, switchgear, current-limiting and dry-type reactors, voltage regulators, transformers, fractional horsepower motors and large turbines. These authorities will also analyze various means of connecting aluminum conductors, the effect of heat cycles on bolted aluminum bus joints, new lamp bases, ACSR for signal and communication systems, corrosion, aluminum-sheathed control cables and life-test studies of aluminum-copper connections.

The 3-day conference will also include visitations to Westinghouse, ALCOA and Duquesne Light plants devoted to the manufacture, research, development and utilization of aluminum products.

NISA News

More than 125 Conventioneers are expected to board the "NISA Limited," a special train that will travel across the United States to the Los Angeles Convention and return by way of the Canadian Rockies.

This trip was arranged by National Headquarters in cooperation with U. S. Travel Agency, who is mailing travel folders to all NISA members. To date, over 50 firms have expressed interest in the 3-week trip.

The "NISA Limited" leaves Chicago June 3. Members in the eastern cities will leave their homes a day earlier to connect at Chicago with the special train.

• • • •

V. A. Bradley, Jr., Bradley's Motor & Armature Works, Corpus Christi,

• WE SHIP FROM STOCK •

POWERCRAFT
PRIMARY
BUS SUPPORTS

These Bus Supports conform to NEMA standards and have been used by many Contractors, Industrials, and Utilities. Available for Indoor and Outdoor service—pipe or flat mounting.

Other POWERCRAFT Products
- Indoor and Outdoor Type Disconnecting Switches
- Bus Clamps • Power Connectors
- Pipe Frame Fittings for 1-1/4" I. P. S. Pipe • Clamp Insulator Supports

• *Our New catalog is yours for the asking*

POWERCRAFT CORPORATION
2215 DeKalb St. St. Louis 4, Mo.
Phone PRospect 6-4532 • Since 1932

★ **THIEL FASTENERS**
for ELECTRICIANS REFRIGERATOR MEN PLUMBERS

THIEL *Easy-Drive* STAPLES
(Pat. #2632356)

THIEL "Easy-On" STRAPS

THIEL *Easy-Drive* "NAIL IT"

SOLD by leading Electrical Wholesalers.
Some territories still open — write for information.

THIEL Tool and Engineering Co.
1417 N. MARKET ST. ST. LOUIS, MO.

Electrical CODE RULES made clear by *PICTURES*

New, Revised Edition fully in line with the latest 1953 CODE

HERE's a new tool for getting work done according to the Code — two giant volumes that give a diagram or schematic drawing for every Code rule, making the meaning of the rule clear at a glance. It's worth the price just to browse through these books, because each rule, and how to apply it on the job, is shown so plainly. You'll pick up many pointers that will stick with you through all your work. And, most important, you'll save time and avoid costly errors in the planning and work stages of any job, because the picture treatment makes it quicker and easier to find and understand a rule, and get the work right.

- Speeds all your electrical planning and installation work — prevents costly violations

ELECTRICAL CODE DIAGRAMS

By B. Z. SEGALL

Registered Professional Engineer

2 Vols. Over 1600 pp., 8½ x 11, over 3100 illus.
Vol. I, $13.50; Vol. II, $15.00
Save $3.50—Special set price only $25.00
Available on easy terms

REGARDLESS of the branch of electricity you work in — whether as an electrician, electrical engineer, architect, or builder — if you *design* or *do* wiring you'll find this set one of the most practical means for understanding the National Electrical Code. Every Code rule can be checked, and the meaning made clear, in very short time because the diagrams follow the numbering of the Code exactly. In addition to these easy-to-follow pictures, background material explains the *why* of the Code.

WHY THESE BOOKS can help you:

- ***BIG*** — No tiny, thumbnail sketches in these books . . . but hundreds of big, clear pictures . . . on pages as large as this magazine.
- ***CLEAR*** — Diagrams are electrically complete, but reduced to essentials to make Code features stand out.
- ***THOROUGH*** — A diagram or picture for every Code rule, parts of rules, exceptions, etc.

ELECTRICAL CODE DIAGRAMS was first published in a private edition by the author some years ago. Practical men in the field sought out the book; thousands of copies were sold. The book proved its worth in on-the-job electrical work, in various training programs, and as an ideal means of getting a working understanding of the Code. Volume I covers wiring design and protection, and wiring methods and materials. Volume II covers equipment for general use, special occupancies, special equipment, special conditions, and communication systems.

READ THESE BOOKS FOR 10 DAYS FREE

McGRAW-HILL BOOK CO., Dept. EC-2
330 W. 42nd St., N. Y. C. 36

☐ Send me Segall's **ELECTRICAL CODE DIAGRAMS**, Volumes I and II, for 10 days' examination on approval. In 10 days I will remit my first payment of $5.00, plus few cents delivery cost, then $5.00 a month until $25.00 is paid. If not satisfied, I will return books postpaid. (We pay delivery costs if you remit with this coupon; same return privilege.)

☐ Send Vol. I—$13.50 ☐ Send Vol. II—$15.00

(Print)
Name .....
Address .....
City .....Zone....State.....
Company .....
Position .....

For price and terms outside U. S., write McGraw-Hill Int'l., NYC EC-2

The pass-word to safety in threatened disaster.

Fire, flood, storm, and air raid are no respecters of persons. Get out! Beat it! Run — and live!

Evacuate personnel, get them out of danger and out of the way for whatever corrective measures are necessary.

A good evacuation alarm system combines sight and sound in an unmistakable, distinctive warning. Federal Sirens, horns, bells, and warning lights provide a warning system for disaster, entirely different and distinctive from other signalling systems.

Don't be caught napping—unprepared. Consult us. Write for Industrial Signal literature today!

FEDERAL SIGN and SIGNAL Corporation

Formerly Federal Enterprises, Inc.

8726 South State Street, Chicago 19, Illinois

MODEL 201

VIBROTEST

- 0-200 megohms at 500 V. D. C. test voltage
- 0-2,000 ohms
- 0-150, 300, 600 volts A. C.
- 0-150, 300, 600 volts D. C.
- Easy-to-read 4½" meter
- Completely portable
- Push-button operation
- Battery power supply
- Rugged steel case

Maintenance men's and electricians' most *useful* tool, Vibrotest is the "packaged" electrical maintenance instrument that saves time and effort—*and gives you accurate test results.*

Size, only 6"x8¼"x8⅞". PRICE, $129.75. Delivery from stock, F. O. B. Chicago.

For complete data on all Vibrotests, write for free Bulletin 2A.

ASSOCIATED RESEARCH, *Incorporated*
"Precision Instruments Since 1936"

3792 BELMONT AVENUE • CHICAGO 18, ILLINOIS

Export Dept., 308 W. Washington Blvd., Chicago 6, Ill.

Hi TRADE MARK REG

Quality Products for the Contractor!

- SPEED WIRING
- SAVE MATERALS
- INSURE SAFETY
- IMMEDIATE DELIVERY
- TERRIFIC SAVINGS IN COST

ONE DEPENDABLE SOURCE FOR ALL!

FISH TAPE REELS AND PULLERS

(8½" & 12" sizes)

- A "3 in 1" Tool
- Speeds wiring
- Saves Tape
- Gives a safe, positive grip

AS A FISH TAPE—High tensile strength permits maximum pull without breaking.

AS A REEL—Protects tape. Holds tape securely yet permitting tape to be run out or reeled in quickly and easily.

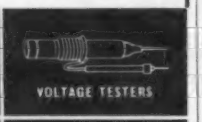
AS A PULLER—Eliminates use of special puller and pliers. Affords positive grip permitting user to exert full strength when pulling tape. Offset seam and smooth surface protects hands. Finish is durable enamel over bonderizing.

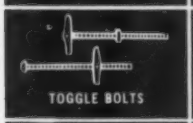
WIRE CONNECTORS

Engineered for broader range of splices, streamlined to fit into shallow outlet boxes. Available in Bakelite and Porcelain "Screw-On" type and in Bakelite "Set Screw" Type. All Hi wire connectors have full UL approval and Underwriters' Laboratories Reel, marker stamped on end of connector. Two sizes approved as Pressure Cable Connectors for general use. Millions in use!

PLASTIC STRAPS

Available in two sizes for non-metallic cable . . . your choice of black or ivory color in both sizes. Rust and corrosion resistant—no insulation cutting—greater safety. Complies with REA. New ivory color perfect for NMC-UF cable.





WRITE FOR FREE SAMPLE PACKETS

Hi HOLUB INDUSTRIES, INC.,

442 ELM ST. SYCAMORE, ILL.

FLORIDA WEST COAST electrical inspectors discussing mutual Code problems at the IAEI Southern Section meeting in Tampa, Fla. were (l. to r.) W. A. Nurnbirg, inspector at Sarasota, and chairman of the Florida Chapter, IAEI; Kenneth D. Brunbaugh, Sarasota County electrical inspector, Sarasota, and formerly electrical engineer for NACA, Cleveland; and W. J. Dawson, Manatee County inspector, Bradenton.

Texas, recently traveled to Jamaica to fix a motor. The trip was at the request of a customer who also has holdings in Jamaica and who paid all expenses for Bradley and his wife.

• • • •

Leo P. Riley recently purchased the stock of Verne L. Dorman in the Dor-Ril Electric, Inc., Peoria, Ill. New officers of the company are Riley, president-treasurer; Frances M. Riley, vice president; Mrs. Charles Nagel, secretary.

• • • •

Charles J. Cannon was recently appointed supervisor of field sales for the J. E. Berger Corp. of Detroit. For 32 years Cannon was general manager of A. H. Nimmo Electric Co., Detroit, before it discontinued operations in December.

• • • •

The Quaker City Chapter held a gala Christmas party at Beck's-on-the-Boulevard on December 8. About 71 members and guests attended. Festivities included dinner followed by group singing, games and distribution of gifts by Santa.

• • • •

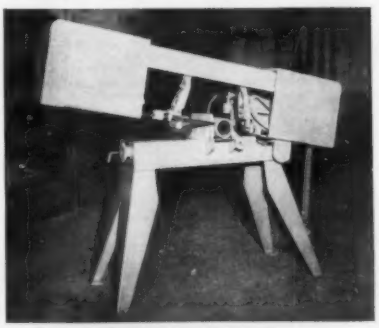
At the November 18 meeting of the New England Chapter's board of directors, Bernard M. Rosenberg, Park Armature Co., Boston, was elected vice president. Rosenberg, who resigned as chapter secretary, will fill the office vacated by the late Daniel A. MacDonald, White Electric Motors Co., Lowell, Mass. Paul Leicht, Empire Electrical Co., Cambridge, Mass., was elected chapter secretary to replace Rosenberg and John P. Lynch, Lynch Electric Co., Wrentham, Mass., was elected a member of the board of directors.

The chapter's regular business meeting was held the same evening and the

10 Seconds of Time Might Save A Good Job

See Page 147

ACCURATE



KALAMAZOO

METAL CUTTING BAND SAW • MODEL 610

CUTS 6" ROUND, 10" FLAT STOCK

Easy to put on your truck and take to the job. Easy to move in your shop. Fast, accurate, rugged. Saves time, effort, cuts costs. Get details today.

MACHINE TOOL DIVISION

Kalamazoo TANK & SILO CO.

240 Harrison Street, Kalamazoo, Michigan

ROYAL

ENGINEERED FUSES
for dependable protection

ROYAL-NOARK
NON-RENEWABLE
5
ways better
on the
inside

use them on
EVERY JOB

ROYAL-NOARK
RENEWABLE
easiest
to
renew

Engineering improvements in the design and construction of ROYAL-NOARK cartridge fuses mean that they stay cooler . . . give greater protection to vital equipment.
. . . ask your wholesaler

ROYAL Quality
WIRE • CARTRIDGE FUSES
famous ROYAL "Crystal" PLUG FUSES
ROYAL ELECTRIC CO., INC. PAWTUCKET, R. I.

directors reported to the members on the election of Rosenberg, Leicht and Lynch.

• • • •

The Southwestern Chapter's board of directors meeting was held January 8 at the Galvez Hotel in Galveston, Texas.

• • • •

King Coal and Greater St. Louis Chapters held a joint meeting in St. Louis on January 11.

• • • •

New officers of Greater Cleveland Chapter are: president, Francis G. Allan, the Elliott Electric Co., Cleveland; vice president, Ralph G. Hoskin, the A-C Supply Co., Akron; secretary, E. C. Harr, Electrical & Mechanical Service Co., Elyria; and Walter R. Kane, Kane Electric Co., E. Cleveland.

• • • •

Baltimore was host for the Eastern Regional Chapter conference of NISA on January 29 at the Southern Hotel.

New England, New York Metropolitan, Quaker City and Electric Motor Service Association (of District of Columbia) were the participating NISA chapters.

Sam Heller of Consolidated Electric Motor Co., New York, presented a paper on "Rectifier Applications; Their Selection and Maintenance." James Taylor of Keystone Electric Co., Inc., Baltimore, discussed "Conversion of Sleeve Bearing Motors to Anti-Friction Operation," and Ralph O. Kufen, Ralph O. Kufen Company, Hatboro, Pa., spoke on "How to Calculate your Own Stator Windings."

Bernard Lipman of Lipman Electric Co., Inc. was chairman of the conference committee; William A. Hoke, Keystone Electric Co.; Charles K. Gibbs, Industrial Electric Co.; and John R. Lange, Lange Electric Co., Inc., were other members of the Committee.

From Walter J. Prise, Queens Electric Motors, Inc., Jamaica, L. I., N. Y.

QUALITY WIRING is promoted by R. J. Roe, Roe Electric Co., Bartow, Fla., who runs an appliance store and does residential wiring only for customers who are willing to put in an adequate job.

ROYAL

RIGHT CONTACT
for dependable
wiring devices

CAPS

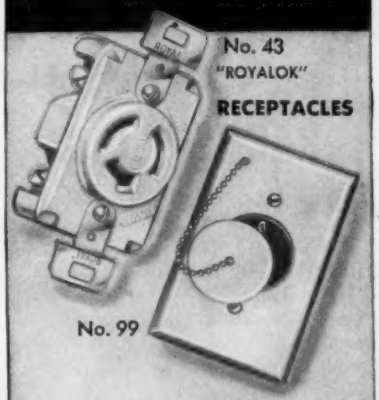
No. 55 No. 31

CONNECTORS

No. 42

use them on
EVERY JOB

No. 43
"ROYALOK"
RECEPTACLES



No. 99

Sound engineering, quality materials, and experienced manufacturing skill make ROYAL wiring devices better for you these three ways: 1) they're easy to wire; 2) always dependable; and 3) long life under constant use.
. . . ask your wholesaler

ROYAL Quality
WIRE • CARTRIDGE FUSES
famous ROYAL "Crystal" PLUG FUSES
ROYAL ELECTRIC CO., INC. PAWTUCKET, R. I.

MODERNIZE YOUR WARNING SIGNAL SYSTEM

with this

NEW extra-compact powerful

BENJAMIN SIREN!

This new siren is especially designed for modern multiple-signal installations, which overcome problems of atmospheric conditions, wind direction and industrial din. A small-yet-powerful high-torque, 10,000 r.p.m. motor and precision-machined housing makes possible extra-compact design. Famous Benjamin built-like-a-battleship construction prevents moisture from entering and assures long, trouble-free operation.

TYPICAL APPLICATIONS OF THE BENJAMIN SIREN

for civil defense

for boiler alarms

for plant protection

It's the 20th Century Pony Express!

FREE

Send for yours TODAY!

FREE SIGNAL BOOK! Send for your copy of this most complete book on signaling! Benjamin Electric Mfg. Co., Dept. H, Des Plaines, Ill.

609 ECM

Another Job Done Better With The ALL-NEW 'Jeep'®

BACKFILLING

Equipped with a hydraulically-controlled blade, the 'Jeep' is an efficient backfiller. Shown here is a blade mounted on a 'Jeep' trencher—a single power unit that does both trenching and backfilling. Get details at your 'Jeep' dealer.

WILLYS MOTORS, INC.
TOLEDO 1, OHIO

The 'Jeep' Family of 4-Wheel-Drive Vehicles : : : UNIVERSAL 'JEEP' • TRUCK • STATION WAGON • PANEL DELIVERY

THE WORLD'S MOST USEFUL VEHICLES

DATES AHEAD

National Rural Electric Cooperative Assn.—Annual meeting, Atlantic City, N. J., February 14-17.

National Adequate Wiring Conference—11th annual conference, LaSalle Hotel, Chicago, Ill., February 24-25.

Upper Midwest Electrical Industry Convention—Hotel Radisson, Minneapolis, Minn., March 6-9.

9th Industrial Electrical Exposition—Sponsored by Manufacturers Division of Essex Electrical League, Olympic Park, Newark, N. J., March 8-10.

National Electrical Manufacturers Assn.—Edgewater Beach Hotel, Chicago, Ill., March 13-18.

Edison Electric Institute—Sales Conference, Edgewater Beach Hotel, Chicago, Ill., March 28-31.

Illuminating Engineering Society—Regional Conferences (1955): Southern—Fort Harrison Hotel, Clearwater, Florida, March 31-April 1; **Southwestern**—Gunter Hotel, San Antonio, Texas, April 3-5; **Inter-Mountain**—Phoenix, Arizona, April 11-13; **South Pacific Coast**—Statler Hotel, Los Angeles, California, April 14-15; **Pacific Northwest**—Harrison Hot Springs Hotel, Harrison Lake, British Columbia (Canada), April 25-26; **Midwestern**—Edgewater Beach Hotel, Chicago, Illinois, May 2-3; **Canadian**—Mount Royal Hotel, Montreal, Quebec (Canada), May 12-13; **East Central**—Abraham Lincoln Hotel, Reading, Pennsylvania, May 19-20; and **Northeastern**—Fort William Henry Hotel, Lake George, New York, June 10-11.

Electrical Maintenance Conference—University of So. Calif., Los Angeles, Calif., April 6-7.

Chicago Electrical Industry Show—Third biennial exhibit sponsored by the Electric Association of Chicago in cooperation with the Electrical Maintenance Engineers of Chicago, Conrad Hilton Hotel, Chicago, Ill., May 10-12.

Pacific Coast Electrical Association,

CHIEF INSPECTORS of Bradenton, Fla., and Austin, Texas, attending annual meeting of Southern Section, IAEI in Tampa, Fla. are respectively, Ralph Wellwood (left) and Charles Tew.

CHIEF INSPECTOR of Tampa, Fla., Russell A. Miller, (right), is congratulated for his outstanding job as general chairman of the Tampa Arrangements Committee for the 26th annual meeting of the Southern Section, IAEI, by L. L. Dick, fellow Tampaite, who is State Manager of the Florida Association of Electrical Contractors.

Inc.—Annual convention, Palace Hotel, San Francisco, Calif., May 11-13.

National Fire Protection Assn.—59th annual convention, Netherland Plaza Hotel, Cincinnati, Ohio, May 16-20.

National Association of Electrical Distributors—47th annual convention, Conrad Hilton Hotel, Chicago, Ill., May 22-25.

National Industrial Service Assn., Inc.—Annual convention, Hotel Statler, Los Angeles, Calif., June 5-9.

Western Plant Maintenance Show—Los Angeles, Calif., July 12-14.

Edison Electric Institute—Annual convention, Los Angeles, Calif., June 13-16.

New York State Association of Electrical Contractors and Dealers, Inc.—Annual convention, Saranac Inn, Saranac Inn, N. Y. June 27-July 1.

Illuminating Engineering Society—National Technical Conference, Statler Hotel, Cleveland, Ohio, September 12-16.

International Association of Electrical Inspectors—Western Section, annual convention, Hotel Nicollet, Minneapolis, Minn., September 26-28.

Electrical Progress Show—Convention Hall, Philadelphia, Pa., September 27-29.

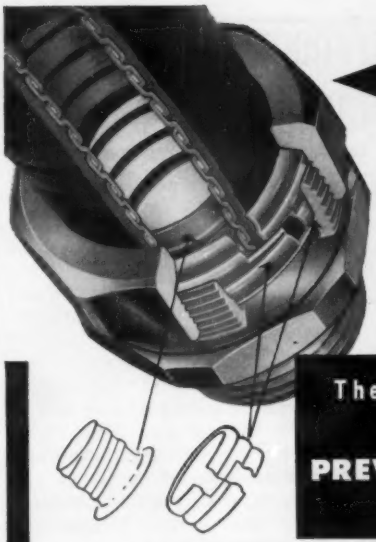
National Electronics Conference—Hotel Sherman, Chicago, Ill., October 3-5.

National Electrical Industries Show—69th Regiment Armory, New York City, October 11-14.

N. J. Council of Electrical Leagues—19th convention, Atlantic City, N. J., October 14-15.

National Electrical Contractors Association—Annual convention, Waldorf-Astoria, New York City, October 31-November 4.

Fifth Industrial Electric Exposition—Hotel Wm. Penn, Pittsburgh, Pa., November 1-3.



SIMPLET

VAP-OIL-TITE CONNECTORS

For Liquid-Tight Flexible Metallic Conduit

The Original and Dependable Split Ring Connector

PREVENTS COSTLY SHORTS and DOWNTIME

The time-proven Simplet Vap-Oil-Tite principle, using a split ring and threaded grounding bushing, insures a permanently safe connection, positively sealed against vapor, oil, water or dust. Compression nut squeezes the grooved split ring, makes it grip the conduit with tremendous pressure, while multiple points of contact between the ring and inside of the connector body provide a perfect seal. Corrosion resistant zinc or aluminum. Write for new bulletin and prices.

SIMPLET **SIMPLET ELECTRIC COMPANY**
WHOLLY OWNED SUBSIDIARY OF IDEAL INDUSTRIES, Inc.
1041 Park Avenue, Sycamore, Illinois

Another Job Done Better With The ALL-NEW 'Jeep'®

TRENCHING

This 'Jeep'-propelled trencher digs trenches up to 5 feet deep at the rate of 300 feet an hour. Mounted on the 'Jeep' and powered by its *Hurricane* Engine, it gets to the job in a hurry, speeds up the laying of pipe, cable or drain tile. Traveling at road speeds to the job, the unit is ready for trenching in a matter of minutes. Greater mobility makes the 'Jeep' trencher profitable for short runs of trench. It will pay you to investigate all the time-saving advantages of the 4-Wheel-Drive Universal 'Jeep'.

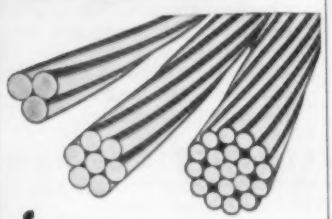
WILLYS MOTORS, INC.
TOLEDO 1, OHIO

The 'Jeep' Family of 4-Wheel-Drive Vehicles . . . UNIVERSAL 'JEEP' • TRUCK • STATION WAGON • PANEL DELIVERY

THE WORLD'S MOST USEFUL VEHICLES

ACCO Quality

PAGE Stainless Steel Strand



for Severe Service Conditions

PAGE Stainless Steel Strand is equally versatile for ground, guy and catenary applications. Its higher tensile strength, corrosion-and-abrasion resistance, elastic limit and strength-to-weight ratio make it your first choice! And—its lower cost per year of use means long-range economy.

ACCO Monessen, Pa., Atlanta, Chicago, Denver, Detroit, Houston, Los Angeles, New York, Philadelphia, Portland, Ore., San Francisco, Bridgeport, Conn.

PAGE STEEL AND WIRE DIVISION
AMERICAN CHAIN & CABLE

TRADE MARK

for Better Value

Among the Manufacturers

Headquarters Announcements

Smith-Gates Corp., Plainville, Conn. —Howard C. Smith, vice president in charge of sales.

Beaver Pipe Tools, Inc., Warren, Ohio—Charles T. Everett, president and general manager.

National Electric Products Corp., Pittsburgh, Pa.—David A. Hinton, manager of the wire and cable dept.

General Electric Co., Nela Park, Cleveland, Ohio—new departments and managers are: large lamps, H. L. Weiss; miniature lamps, K. G. Reider; and E. A. Howard, R. F. Johnson and W. P. Cartun will head various parts production depts.

Edwards Co., Norwalk, Conn.—John L. Taylor, vice president in charge of sales.

Moloney Electric Co., St. Louis, Mo. —John J. Knox, assistant sales manager; Chester W. Perkins, vice president in charge of application engineering.

Westinghouse Electric Corp., Pittsburgh, Pa.—Matthew Westphal, manager of lamp division plant in Trenton, N. J.

Alpha Wire Corp., New York, N. Y. —Charles Fishbein, national sales engineer.

Circle F Manufacturing Co., Trenton, N. J., has purchased the Eastern Insulated Wire Corp. of Wallingford, Conn.

General Electric Co., Schenectady, N. Y.—Francis K. McCune, Robert L. Gibson and Willard H. Sahloff, vice presidents.

Allen B. Du Mont Laboratories, Inc., Clifton, N. J.—William B. Kelley, vice president and general manager of all sales and manufacturing divisions.

Pyle-National Co., Chicago, Ill.— Newell L. Willard, assistant manager of industrial sales.

Crescent Co., Inc., Pawtucket, R. I. —Kenneth R. MacLean, general sales manager.

Electric Storage Battery Co., Philadelphia, Pa.—Carl F. Norberg, president.

Malleable Iron Fittings Co., Branford, Conn.—Ogden W. Sutro, assistant to the president; Albert B. Stevens, sales manager of pole hardware div.

BullDog Electric Products Co., Detroit, Mich.—Henry C. Egerton, vice president.

Joy Manufacturing Co., Pittsburgh, Pa.—R. G. Gehlsen, manager of electrical connector products; H. B. Zep-

10 Seconds Can Make Or Break The Biggest Job

SEE PAGE 147

ACCURATE

Millions of Steel
JIFFY CLIPS
Serving the Electrical Industry

Specify
MINERALLAC
HANGERS, CLIPS, STRAPS, BUSHINGS

Expert design, choice materials and controlled manufacture have built "top-service and longest life" into Mineralloc Electrical Specialties. That's why the electrical industry "prefers Mineralloc"... in steel and Everdur for hanging pipe, conduit, BX cable, etc.

Send for new literature and prices.

MINERALLAC ELECTRIC COMPANY
25 North Peoria Street—Chicago 7, Illinois

MINERALLAC

BEST STARTING POINT to sell home wiring modernization is a Package Plan for adequate service capacity, contractor H. M. Gibson, president, Gibson Electric Co., tells electrical contractors attending Chicago Electric Association Business Building Conference. Reason: the customer is offered something definite at an advertised price.

penfeld, sales manager of same dept.

Line Material Co., Milwaukee, Wis.—Richard C. Kirk, chief engineer, Kyle products plant; Frank W. McStay, manager of Kyle product sales.

Westinghouse Electric Corp., Pittsburgh, Pa.—William M. McMunn, sales manager for manufactured products.

Federal Pacific Electric Co., Newark, N. J.—Howard D. Tindall, manager of the transformer division.

Capewell Manufacturing Co., Hartford, Conn.—William C. Heard, domestic sales manager.

Kerite Co., New York, N. Y.—Theodore O. Rudd, president; C. R. R. Harris, chairman of the board and chief executive officer.

Dana Corp., Toledo, Ohio, is the new name of the Spicer Manufacturing Co.

Joy Manufacturing Co., Pittsburgh, Pa.—John D. Russell, vice president, engineering.

Solar Light Manufacturing Co., Chicago, Ill.—Leonard V. James, technical consultant.

Diamond Power Specialty Corp., Lancaster, Ohio—Willis I. McCord, manager of electronic sales.

Regional Appointments

NEW ENGLAND

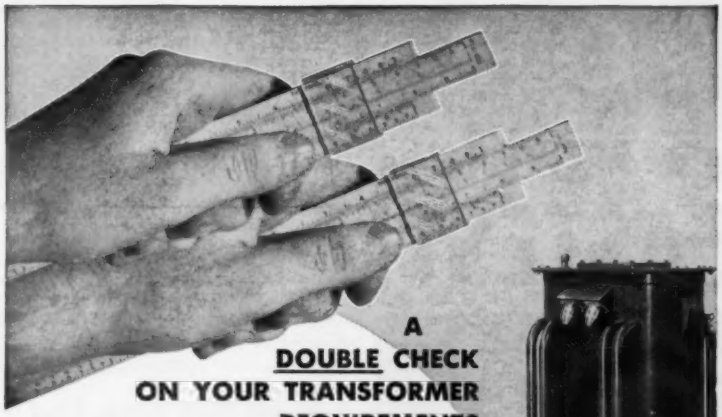
Jefferson Electric Co.: John E. Lee, sales representative; offices in New Haven, Conn.

MIDDLE ATLANTIC

Pittsburgh Reflector Co.: Ralph M. Davis, Pittsburgh area sales.

Allen-Bradley Co.: Charles H. Hawks, Pittsburgh district manager.

Burndy Engineering Co., Inc.: New York City area sales office has been relocated to 20 East First St., Mt. Vernon, N. Y.



A
DOUBLE CHECK
ON YOUR TRANSFORMER
REQUIREMENTS

No doubt your plant engineers already know the transformer requirements of your plant. But, here's a STANDARD service available to you. Before you buy, call in your local STANDARD representative. Let him and STANDARD engineers double-check your findings. Then you know your transformer needs have been properly evaluated and you can install with confidence.

75 KVA Subway Type 01SC Transformer.

Standard
THE STANDARD TRANSFORMER COMPANY
WARREN, OHIO
REPRESENTATIVES IN PRINCIPAL CITIES

on parts for Brown & Brockmeyer • Century • Delco • General Electric • Jack & Heintz • Leland • Marathon • Packard • Redmond • Sunlight • Wagner • Westinghouse—*motors*

Write for catalog—on your letterhead—to

The HARRY ALTER CO., Inc.
1728 S. Michigan Ave. Chicago, Illinois
134 Lafayette St. New York, N. Y.

WHOLESALE ONLY

HARRY ALTER gives you snappy service!

IT TAKES TWO

DISPLAY ADVERTISING • AROUSES INTEREST • CREATES PREFERENCE
DIRECT MAIL • GETS PERSONAL ATTENTION • TRIGGERS ACTION

After your prospect has been convinced by Display Advertising, he still must act. A personalized mailing piece, is a powerful action-getter. Send for our Industrial Direct Mail Catalogue, 150 lists available.

Direct Mail Division,
McGraw-Hill Publishing Co., Inc.
330 West 42 St., N. Y. 36, N. Y.

Please forward my free copy of the McGraw-Hill "Industrial Direct Mail Catalogue."

Name_____
Company_____
Address_____
City_____ State_____

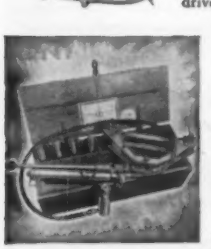
Why the world's HANDIEST benders also PROVE to be FASTEST!

Here's a happy electrician! His handy, portable Blackhawk Bender permits bench-top as well as floor operation . . . makes kinkless bends, matched offsets and rigid installations easy.

FASTEST . . . because the Blackhawk "Porto-Power" *remotely-controlled* hydraulic jack operates in any position . . . on its side or upright . . . whichever way it's easiest to measure the bend.

FASTEST . . . because it's *really* portable. You can use it on the floor, on the bench or overhead on existing pipe runs. And — it's easy to roll or carry to the job.

FASTEST . . . because you can simultaneously pump and sight the job from any angle . . . assure better bends. Can be hand operated or motor driven.



LOW COST TOO!

Example: The S-30A kit for bending 1 to 2" rigid conduit contains powerful "Porto-Power" hydraulic jack and 9 bending attachments . . . costs only $135.45

Price subject to change without notice

BENDERS FOR ALL WORK — For thinwall or conduit up to 4" — Blackhawk Benders pay for themselves in a hurry. Order from leading supply houses or write for catalog 50-B. Blacknawk Mfg. Co., Dept. J-2025 Milwaukee 1, Wisconsin.

BLACKHAWK

Pennsylvania Transformer Co.: J. B. Sullivan, Syracuse, N. Y., district sales manager.

Pyle-National Co.: David Stiles, Philadelphia, Pa., sales representative.

SOUTH ATLANTIC

Graybar Electric Company: W. E. James, Richmond district sales manager, covering Virginia and North Carolina.

Day-Brite Lighting, Inc.: Joe L. Booker, southern sales manager.

Phelps Dodge Copper Products Corp.: Albert L. Soulé, district sales engineer for Alabama, west Florida and east Tennessee.

Allis-Chalmers Manufacturing Co.: Charles W. Parker, Jr., manager of Richmond, Va., district.

EAST CENTRAL

Allen-Bradley Co.: T. C. Herbes, manager of Flint, Mich., office.

Mycalex Corp. of America: L. F. Thompson, manager of new Chicago, Ill., sales office at 6677 N. Northwest Highway.

Mitchell Manufacturing Co.: William Crockett, sales representative for northern Indiana, Michigan and Ohio.

Line Material Co.: John L. Barger, field engineer for western and northern Michigan with offices in Grand Rapids.

WEST CENTRAL

D. W. Onan & Sons Inc.: Carl Brady, sales zone manager for South Dakota and Nebraska and parts of Iowa, Kansas, Missouri and North Dakota; headquarters in Minneapolis.

U. S. Expansion Bolt Co.: Roger R. Peterson, district sales manager covering North and South Dakotas, Nebraska, Kansas, Minnesota and Iowa west of Cedar Rapids; offices in Chicago, Ill.

Mycalex Corp. of America: D. A. Schultz, manager of new Minneapolis, Minn., office at 801 S. E. 8th St.

Graybar Electric Co.: V. R. Young, district sales manager with headquarters in Dallas, Texas; C. C. Ross, Fort Worth, Texas, manager; H. J. Frantz, branch manager at Austin, Texas.

Ilsco Corp.: Frank P. Deveny, sales representative for Minnesota, the Dakotas, Nebraska and parts of Iowa and Wisconsin; offices in Minneapolis.

General Electric Co.: Delta sales district offices of the lamp division have been moved to the new warehouse at 4800 River Road, New Orleans, La.

WEST

Bristol Co.: Alden D. Webber, field sales engineer for Seattle, Oregon.

Mycalex Corp. of America: Kenneth V. Tindall, manager of new Pacific sales division with headquarters in Los Angeles, Calif.

WHERE TO BUY

Equipment, Materials, Supplies and Services for Electrical Construction—Maintenance—Repairs

A TRADE-MARK

HINDLE TRANSFORMER COMPANY INC.

YOU CAN RELY ON

Backed by more than 15 years experience in transformer design and manufacture.

HINDLE TRANSFORMER CO., INC.
Woods Church Road, Flemington, N. J.

Saves Labor—Cuts Costs—VERSATILE!
1. Hammer and Drill combined in one portable unit.
2. Quickly convertible to ⅜" heavy-duty drill for drilling in metal.
3. Hammer strikes 2400 blows a minute. 15 times faster than hand methods.

WODACK ®

COMBINATION ELECTRIC HAMMER and DRILL

Request Bulletin 510-EC

Wodack Electric Tool Corp.
4627 W. Huron St., CHICAGO 44, ILL.

D.C. SUPPLY FROM A.C. MAINS
SELENIUM & GERMANIUM RECTIFIERS

- *EFFICIENT*
- *DEPENDABLE*
- *LOW COST*
- *PORTABLE*

From 1 to 100,000 Amps.

For Industrial, Laboratory & Plating Use
GENERAL NUCLEAR CORP.
550 FIFTH AVE., N. Y. 36, N. Y.
Distributor Inquiries Invited

ROBOT OPERATORS
OPEN - CLOSE - LOCK DOORS, GATES
. . . Electronically

COMMERCIAL, INDUSTRIAL
RESIDENTIAL & SPECIAL
Write for Catalog . . .
ROBOT APPLIANCES, INC.
7041 ORCHARD - DEARBORN, MICHIGAN

THIS WHERE TO BUY SECTION . . .

is a special classification for manufacturers desiring advertising in space units smaller than the minimum run of book display space. Space is available in this section in units from one to four inches. Every advertisement is indexed. This section can be used economically to promote new product users and uses, establish new sales outlets, reach the buying influences—at an extremely low cost.

CLASSIFIED SEARCHLIGHT SECTION ADVERTISING

EMPLOYMENT • BUSINESS • OPPORTUNITIES • EQUIPMENT—USED or RESALE

UNDISPLAYED RATE

$1.20 a line, minimum 3 lines. To figure advance payment count 5 average words as a line.

POSITIONS WANTED undisplayed advertising rate is one-half of above rate, payable in advance.

PROPOSALS, $1.20 a line.

INFORMATION:

BOX NUMBERS count one line additional in undisplayed ads.

DISCOUNT of 10% if full payment is made in advance for four consecutive insertions of undisplayed ads (not including proposals).

EQUIPMENT WANTED OR FOR SALE Advertisements acceptable only in Displayed Style.

DISPLAYED—RATE PER INCH:

The advertising rate is $11.00 per inch for all advertising appearing on other than a contract basis. Contract rates quoted on request.

AN ADVERTISING INCH is measured ⅞ inch vertically on one column, 3 columns—30 inches —to a page. E.C.&M.

New ADVERTISEMENTS: address New York office, 330 W. 42nd St., N. Y. 36, N. Y. for March issue closing February 21st

ELECTRICAL ENGINEER
for
DEPT STORE ORGANIZATION

Capable of design of general lighting & power wiring in commercial construction. Work consists of review of plans, design of lighting systems, inspection of installations & preparation of maintenance procedures. Some travel from N. Y. office. Age 30-40. Salary $7000.

Forward complete resume to:

P-5194, Electrical Construction & Maintenance
330 W. 42 St., New York 36, N. Y.

REPLIES (Box No.): Address to office nearest you
NEW YORK: 330 W. 42nd St. (36)
CHICAGO: 520 N. Michigan Ave. (11)
SAN FRANCISCO: 68 Post St. (4)

SELLING OPPORTUNITIES OFFERED

WANTED ELECTRICAL Sales Engineer to travel Indiana, Ohio, Illinois, Southern Michigan. Make take-offs and handle bid follow-through on line of industrial and commercial electrical distribution equipment. Car, salary, bonus, expenses. Possible future sales management. Daly Equipment Co., 111 143rd St., Hammond, Ind.

AGGRESSIVE REPRESENTATIVE wanted by nationally known manufacturer of a complete line of Fluorescent and Slimline fixtures, including new type Plexi-glass bottom units. Deliveries prompt, and competitively priced, territories open in New England, New York, Pennsylvania, Illinois, Michigan, Texas, Florida, Louisiana, etc. RW-5289, Electrical Construction & Maintenance.

U. S. Government

Sealed bids will be received in the office of Engineering and Construction Director, Panama Canal Company, Balboa Heights, Canal Zone, until 10:00 A.M., EST, March 11, 1955 for furnishing all labor, equipment, material and performing all work required for alteration of Gatun Hydro-electric Station and outdoor switchyard; conversion of station service, penstock headgate, spillway equipment from 25 to 60 cycle; construction of a new control room; purchase and installation of new transformers, metal clad switchgear and associated bus duct. Plans and specifications are available for examination in the office of Procurement Officer, Panama Canal Company, 21 West St., New York 6, N. Y., and copies may be obtained upon payment of $40.00 deposit. For further information call Bowling Green 9-5380.

WANTED

ANYTHING within reason that is wanted in the field served by Electrical Construction and Maintenance, can be quickly located through bringing it to the attention of thousands of men whose interest is assured because this is the business paper they read.

WANTED NOW!

Men who seek opportunities in Creative Sales Engineering

These men will go into key sales positions in cities throughout the country.

- We prefer men not over 35 who have had experience with low-voltage distribution systems and associated products in contracting organizations, with consulting engineers or with utilities.
- We prefer men with college degrees in engineering, but this is not a fixed requirement. If you have experience that compares to the training you would have received in college, we are interested in you.

If you are interested, you will have top-notch product lines and the engineering backup of one of the country's most respected and progressive manufacturers.

Your reply will be held in complete confidence.

WRITE TO BOX P5173
Electrical Construction & Maintenance
330 W. 42nd St., New York 36, N. Y.

BOOKS

ELECTRICAL CONTRACTORS ESTIMATING HANDBOOK
"A Unique Tool of the Trade"
WRITE FOR DESCRIPTIVE FOLDER TO
THE ESTIMATOR PUBLISHING CO.
4102 Wilson Road Kenosha, Wis.

ELECTRICAL WIRE AND CABLE
—Your Best Source—
- for every industrial and power application
- Odd lengths—long and short—reasonably priced

One of the Largest Stocks in the Midwest
Let us quote on requirements—send your inquiries
We'll also buy your Surplus
Branch Offices:
Houston—Yukon 5547 Los Angeles—ANgeles 3-5148
UNIVERSAL Wire and Cable Co.
2682 N Clybourn Ave., Chicago 14, Ill.
EAstgate 7-4777 Code: UNIWIRE

Somebody—Somewhere,
needs your idle equipment! Reach that buyer quickly and economically thru the
"SEARCHLIGHT SECTION"
The meeting place of Used Equipment Buyers and Sellers

Advertising In This Issue

Abolite Lighting Div., Jones Metal Products Co. 188
• Accurate Mfg. Co....147, 194, 202, 206
• Adam Electric Co., Frank..... 57
Allen-Bradley Co. 33, 34
• Allis-Chalmers Mfg. Co.....6, 17
• All-Steel Equipment, Inc..... 63
Alter Co., The Harry..... 207
American Brass Co., The American Metal Hose Branch..... 173
American Electric Switch Div. of Clark Controller Co..... 112
• American Steel & Wire Div. of U. S. Steel Co.....60, 61
Amplex Corp. 155
Anaconda Wire & Cable Co.....116, 117
Appleton Electric Co..... 2
• Arro Expansion Bolt Co..... 189
• Art Metal Co., The..... 180
Associated Research, Inc..... 201

Baldor Electric Co..... 45
• Barth Corporation, The..... 146
Belden Manufacturing Co..... 62
Benjamin Electric Mfg. Co..... 204
Biddle Co., James G..... 199
Blackhawk Mfg. Co..... 208
Briegel Method Tool Co..... 49
Bryant Electric Co., The..... 40
Buffalo Forge Co..... 158
• BullDog Electric Products Co..... 105
Burndy Engineering Co..... 99

• Century Electric Co..... 118
Champion DeArment Tool Co..... 196
• Circle F Mfg. Co..... 104
Clifton Conduit Co., Inc..... 37
Coffing Hoist Co..... 172
Columbia Cable & Electric Corp..... 43
• Conduit Pipe Products Co..... 196
Continental Wire Corp..... 190
• Cope, Inc., T. J.....46, 47
Crescent Ins. Wire & Cable Co..... 25
• Crouse-Hinds Co. 22, 23
Crown Industrial Products Co..... 184
Cutler-Hammer, Inc. 115

Day-Brite Lighting, Inc..... 185

Edwards Co. 1
Efficiency Elec. & Mfg. Co..... 188
Electrical Construction & Maintenance 58
Electrical Facilities Inc..... 182
Electric Service Mfg. Co.....160, 161
Electromode Corporation 163

• Federal Pacific Electric Co.....26, 27
• Federal Sign & Signal Corp..... 201
Fullman Mfg. Co..... 154
Furnas Electric Co..... 200

• General Electric Co.
• Apparatus Sales Div.....Second Cover
• Construction Materials Div. Fourth Cover, 128, 129
Laminated & Ins. Prod. Div..... 15
Lamp Division 183
Trumbull Components Dept...106, 107
Wiring Device Dept..... 130
General Nuclear Corp..... 208
• Graybar Electric Co., Inc..... 66
Greenlee Tool Co..... 167
• Guth Co., The Edwin F..... 16

Hazard Insulated Wire Works.....8, 41
Heinemann Electric Co..... 197
• Helwig Co. 196
Hindle Transformer Co., Inc..... 208
• Holub Industries, Inc..... 202

• Ideal Industries, Inc.....175, 195
I-T-E Circuit Breaker Co....122, 123, 192

• Johns-Manville 50
Jones Metal Products Co., The..... 188

Kalamazoo Tank & Silo Co..... 202
Keystone Mfg. Co..... 126
• Killark Electric Mfg. Co..... 21
Klein & Sons, Mathias..... 150
Kuhlman Electric Co..... 108

• Leviton Mfg. Co..... 151
Litecontrol Corp..... 24

Marlou Lights, Inc..... 168
McGill Mfg. Co., Inc..... 36
McGraw-Hill Book Co..... 201
• Midwest Electric Mfg. Co..... 134
• Minerallac Electric Co..... 206
• Moloney Electric Co..... 51

• Okonite Co., The.....8, 41
Onan & Sons Inc., D. W..... 179
• Oster Mfg. Co., The..... 52

Page Steel & Wire Division American Chain & Cable..... 206
Pass & Seymour, Inc..... 44
Permacel Tape Corp..... 165
• Phelps Dodge Copper Products Corp.. 64
Pierce Renewable Fuses, Inc..... 149
• Porcelain Products, Inc..... 113
Powder Power Tool Corp..... 157
• Powercraft Corp. 200
Pyle-National Co., The..... 35
Pyramid Instrument Corp..... 191

Quadrangle Mfg. Co..... 174

Radio Corp. of America..... 187
Ramset Fasteners, Inc..... 162
• Rawplug Co., Inc., The..... 159
RCA Service Co., The..... 178
Reel-O-Matic Corp. of America..... 198
Republic Steel Corp.....30, 31
Revere Electric Mfg. Co..... 198
Ridge Tool Co., The..... 114
RLM Standards Institute, Inc..... 32
Robot Appliances, Inc..... 208
Rockbestos Products Corp..... 28
• Rodale Mfg. Co.....152, 153
Roeblings Sons Corp., John A..... 101
Roller-Smith Corp. 53
• Rome Cable Corp.....12, 13
Royal Electric Co., Inc..... 203
• Russell & Stoll Co., Inc..... 169

• S&C Electric Co..... 103
Sangamo Electric Co..... 177
• Signal Engineering & Mfg. Co..... 190
Simplet Electric Co..... 205
• Simplex Wire & Cable Co..... 110
• Skylike Lighting, Inc..... 42
Spang-Chalfant (Div. of the National Supply Co.) 127
Square D Co.....Third Cover, 29
• Standard Transformer Co..... 207
Steel & Tubes Division.....30, 31
• Sticht Co., Inc., Herman H..... 194
Sylvania Electric Products, Inc..... 166

• Thiel Tool & Eng. Co..... 200
Thomas & Betts Co., The.....38, 39
Thompson Electric Co., The..... 176
Titchener & Co., E. H..... 194
• Triangle Conduit & Cable Co., Inc.. 56

• United States Rubber Co.....18, 19
Universal Motor Co..... 156
Uptegraff Mfg. Co., R. E..... 11
• Utica Drop Forge & Tool Corp..... 186

Van Cleef Bros., Inc..... 55

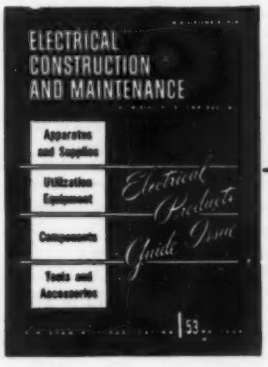
• Wadsworth Electric Mfg. Co. Inc... 178
• Wagner Electric Corp.....20, 170
• Wagner Malleable Products Co..... 121
Wakefield Brass Co., F. W., The..... 14
Western Insulated Wire Co.....124, 125
Westinghouse Electric Corp. (Pittsburg) 137, 138, 139, 140, 141, 142, 143, 144
Weston Electrical Instrument Corp... 54
• Wheeler Reflector Co..... 59
Where To Buy..... 208
• Wiegand Co., Edwin L..... 145
Willys Motors, Inc.....204, 205
• Wiremold Co., The..... 148
• Wodack Electric Tool Corp..... 208

Youngstown Sheet & Tube Co., The.. 48

■

SEARCHLIGHT SECTION
(Classified Advertising)
H. E. Hilty, Mgr.

EMPLOYMENT
Positions Vacant 209
Selling Opportunities Offered..... 209
EDUCATIONAL
Books 209
NOTICES
Proposal 209
EQUIPMENT
(Used or Surplus New)
For Sale 209
WANTED
Equipment 209



• These manufacturers advertised their products in the ELECTRICAL PRODUCTS GUIDE

For more complete information, and application data on their lines, refer to the index of Advertisers in the ELECTRICAL PRODUCTS GUIDE . . . the 13th issue of ELECTRICAL CONSTRUCTION AND MAINTENANCE.

Qwik Change

with **PACKAGED Motor Starter PARTS!**

New PUSH BUTTON KIT

OTHER KITS...

- Selector Switches
- Interlocks
- Replacement Parts
- Contacts
- Coils
- Overload Relays

EASY to Identify!

Easy-to-read catalogs, simplified motor control and overload relay selectors, illustrated service bulletins...these all combine to assure *quick changes* through easy parts identification.

EASY to Buy!

Conveniently packaged and labeled conversion parts are immediately available "off-the-shelf" from nationwide network of authorized SquareD electrical distributors.

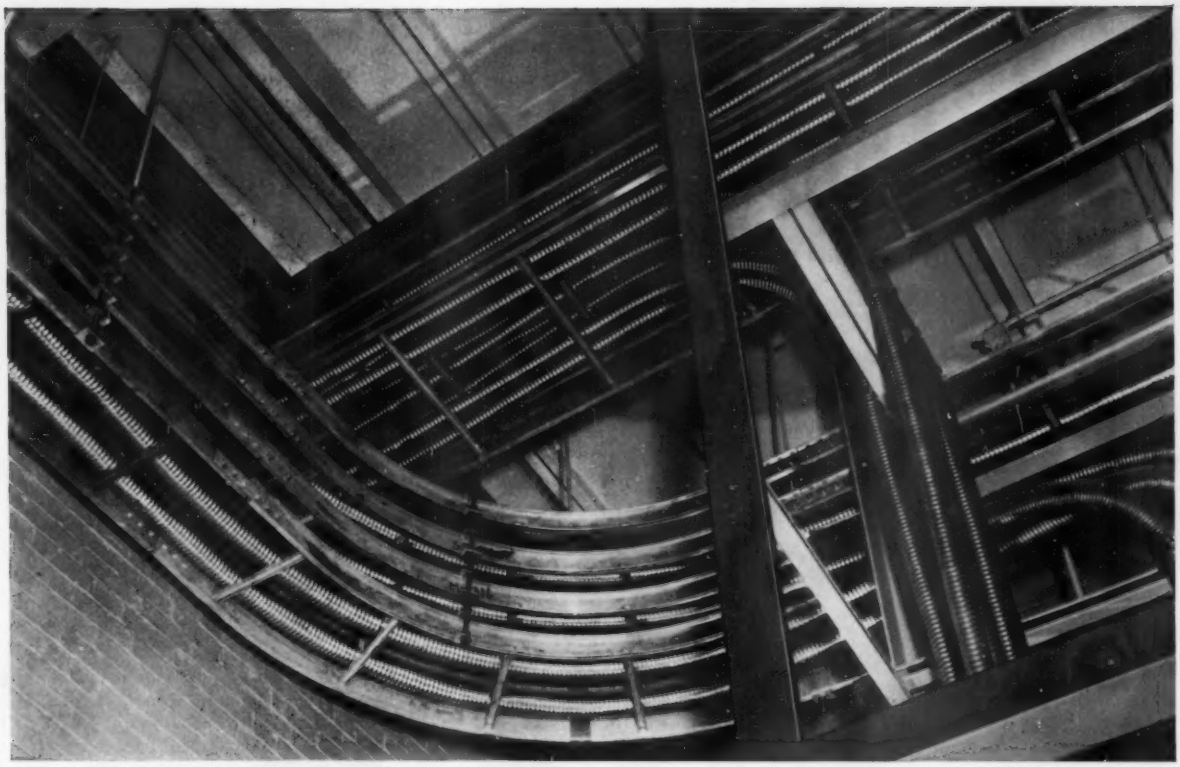
FASTER to Install!

Conveniently packaged parts can be installed using only a screw driver and without disturbing any wiring.

Write for Bulletin 9999. Address Square D Company, 4041 North Richards Street, Milwaukee 12, Wisconsin.

ASK YOUR ELECTRICAL DISTRIBUTOR FOR SQUARE D PRODUCTS

SQUARE D COMPANY

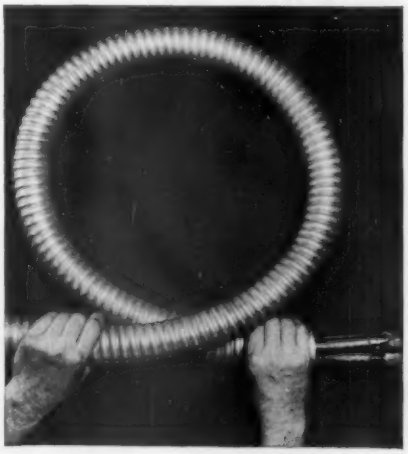


HOW TO SIMPLIFY FEEDER INSTALLATIONS

Solve the problem of installing cable in congested areas with a G-E V-c interlocked armor cable system

The easiest way to speed installation of primary and secondary feeder systems is to use lightweight, flexible G-E interlocked armor cable—indoors or outdoors. Easily-installed racks or troughs can be attached to existing structures. Corners and long unbroken runs are no problem because the cable is flexible, and is supplied in lengths to meet the requirements of the job. This cable system weighs only about a third as much as conventional cable and conduit installations, and the small over-all cross section of interlocked cable permits easy installation in crowded areas. Splicing is a simple mechanical job—easily done by electricians on the site.

For more information see your G-E Construction Materials distributor or write Section W142A-218, Construction Materials Division, General Electric Company, Bridgeport 2, Connecticut.



The flexibility of G-E interlocked armor cable saves layout and installation time because the cable can be run easily around corners and over beams.

Progress Is Our Most Important Product

REWIRE AMERICA
WITH GENERAL ELECTRIC WIRING SYSTEMS

GENERAL ELECTRIC